XA600 Series Industrial Intelligent Controller

User Manual [Hardware Section]

Wuxi Xinje Electric Co., Ltd.

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XINJE Xinje Electric

XA600 Series Industrial Intelligent Controller User Manual [Hardware Section]

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Basic Information

- Thank you for purchasing the Xinje XA600 series industrial intelligent controllers.
- This manual primarily introduces the hardware specifications and other relevant information for the XA600 series industrial intelligent controllers.
- Before using the product, please read this manual carefully and proceed with wiring only after you have fully understood its contents.
- For information on software and programming, please refer to the relevant manuals.
- Please deliver this manual to the end user.

User Guide

- Only operators with a certain level of electrical knowledge may perform tasks such as wiring the product; if you have any questions regarding the use of this product, please consult our technical personnel.
- The examples listed in this manual or other technical documentation are for user understanding and reference only; they do not guarantee that the described actions will always be performed correctly.
- When using this product in combination with other products, please verify that it complies with the relevant specifications, principles, and other requirements.
- When using this product, please verify independently whether it meets the requirements and is safe to use.
- Please configure the backup and safety functions yourself to prevent any machine malfunctions or losses that may arise due to a failure of this product.

Disclaimer

- Although the content in this manual has been carefully verified, errors are inevitable; we cannot guarantee absolute accuracy.
- We regularly review the content of this manual and will make corrections in future versions; we welcome your valuable feedback.
- Should any changes be made to the information contained in this manual, we apologize for any inconvenience and will not provide additional notice.

Contact way

If you have any questions regarding the use of this product, please contact the distributor or office where you purchased the product, or you may contact Xinje Company directly.

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July 2026

Unboxing and Inspection

Before opening the packaging, please verify that the product model indicated on the outer packaging matches the model of the product you ordered. After opening the packaging, first inspect the surface of the industrial controller for any mechanical damage, then carefully check whether all accessories are present according to the packing list or the purchase contract. If the surface of the industrial controller is damaged or if the contents of the product do not match the description, do not use the product and contact your distributor immediately.



Attention

To prevent static electricity from damaging industrial controllers, please touch a properly grounded metal object before handling the controller's circuits to discharge any static charge accumulated on your body, and wear anti-static gloves.

Safety Precautions

Upon receipt of the product, please verify its condition across the following aspects. Before using this product, please carefully read this section and proceed only after you have fully understood the product's usage, safety precautions, and other relevant information. Please ensure that the product is wired correctly while maintaining the highest level of safety awareness.

Potential issues that may arise during product use are generally covered by the safety precautions, all of which are classified into two categories: "Caution" and "Danger." For any other matters not explicitly addressed herein, please adhere to the basic electrical operating procedures.

 Attention	Improper use may pose hazards, including the risk of moderate injury or minor injury, as well as the potential for property damage.
 Danger	When used incorrectly, the product may pose a danger, potentially causing personal injury or serious harm, or leading to significant property damage.

- Product Receipt Confirmation

 Attention
1. Do not install controllers that are damaged, missing components, or do not meet the required model specifications. There is a risk of injury.

- Product System Design

 Danger
1. Please design an external safety circuit for the controller to ensure that the entire system continues to operate safely even in the event of a controller malfunction. There is a risk of misoperation or failure.

 Attention
1. Do not bundle control wiring together with power wiring; in principle, maintain a separation of at least 10 cm. Failure to do so may cause misoperation or damage to the product.

- Product Installation

Danger
1. Before installing the controller, please ensure that all external power supplies are disconnected. There is a risk of electric shock.

Attention
1. Install and use this product under the environmental conditions specified in the General Specifi-cations section of this manual. Do not use in humid, high-temperature, dusty, smoky, or environments containing conductive dust, corrosive gases, flammable gases, or where there is vibration or impact. May cause electric shock, fire, malfunction, product damage, etc. 2. Do not touch the conductive parts of the product directly. May cause misoperation or malfunction. 3. Please secure this product using a DIN46277 rail and install it on a flat surface. Incorrect installation may lead to malfunction or damage to the product. 4. During the machining of screw holes, avoid allowing cutting powder or wire debris to fall into the product casing. May cause misoperation or malfunction. 5. When connecting an expansion module using an extension cable, ensure that the connection is secure and has good contact. May cause poor communication or malfunction. 6. When connecting peripheral devices, expansion devices, batteries or other equipment, please ensure that the power is turned off before performing the operation; this may prevent unintended operation or malfunction.

- Product Wiring

Danger
1. Before performing any wiring operations on the controller, please ensure that all external power supplies are disconnected. There is a risk of electric shock. 2. Please correctly connect the AC or DC power supply to the controller's dedicated power terminals. Incorrect power supply connection may burn out the controller.

Attention
1. Use 2 mm² cable for the third type of grounding connection to the grounding terminals of the controller and expansion devices; this connection must not be connected to the common grounding point of the high-voltage power system. May cause malfunctions, product damage, etc. 2. Do not perform external wiring on the empty terminals. May cause improper operation or product damage. 3. When machining screw holes, take care not to allow cutting powder or wire debris to fall into the product casing. May cause misoperation, malfunctions, etc. 4. When using wire connection terminals, ensure they are tightened securely; do not allow the conductive parts to come into contact with any other wires or terminals, as this may cause malfunction or damage to the product.

- Product Operation and Maintenance

 Danger
1. After powering on the controller, do not touch its terminals. There is a risk of electric shock. 2. Do not perform wiring, disconnection, or similar operations on the terminals while the device is powered on. There is a risk of electric shock. 3. Before modifying the program in the controller, be sure to stop it first. May cause incorrect operation.

 Attention
1. Do not disassemble or assemble this product without authorization. May cause damage to the product. 2. Please plug in or unplug the connecting cable when the power is off. This may cause cable damage or lead to incorrect operation. 3. Do not perform external wiring on the empty terminals. May cause improper operation or product damage. 4. Before disassembling expansion devices, peripheral devices, or the battery, please disconnect the power supply first. May cause misoperation, malfunction, etc. 5. When disposing of the product, treat it as industrial waste.

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Preface

This section describes the content structure of this manual, its scope of application, the customary practices outlined within it, an introduction to related manuals, and the ways to obtain the relevant materials.

Manual Content Structure

This manual covers the selection and system configuration of the XA600 series industrial intelligent controllers; it primarily provides information on the specification parameters, input/output wiring, and operation and maintenance of the XA600 series industrial intelligent controllers.
This manual is divided into nine chapters based on its content; an overview of each chapter is as follows:

Section	Section Title	Section Content
1	Product Overview	This document primarily introduces the performance features, model numbering system, complete product range, and component descriptions of the XA600 series industrial intelligent controllers.
2	Product Specifications	This document primarily introduces the general specifi-cations, performance specifications, and external dimensions of the basic unit in the XA600 series industrial intelligent controllers.
3	System Architecture	This document primarily describes the system architecture centered around the XA600 series industrial intelligent controllers, the peripheral devices, and the installation procedures for the products.
4	Power Supply Specifications and Wiring Method	This document primarily describes the power supply specifications and wiring methods for the XA600 series industrial intelligent controllers.
5	Input Specifications and Wiring Method	This document primarily describes the input specifications and input wiring for the XA600 series industrial intelligent controllers.
6	Output Specifications and Wiring Method	This document primarily introduces the output specifications and transistor-output processing capabilities of the XA600 series industrial intelligent controllers.
7	BIOS Settings	This document primarily introduces the BIOS configuration for the XA600 series industrial intelligent controllers.
8	Operation, Debugging, Maintenance	This document primarily covers the operation, debugging procedures, and routine maintenance of the XA600 series industrial intelligent controllers.
9	Soft Component Switching	This section introduces a key feature of the XA600 series industrial intelligent controllers: the flexible switching function for input and output points.
Appendix	Appendix	This document primarily introduces the special software component addresses and functions, the command list, and the fault troubleshooting guide for the XA600 series industrial intelligent controllers.

Scope of Application

This manual is the hardware documentation for XA600 series industrial intelligent controller products; it contains the following product information:

Product name	Product information
XA600 Series Industrial Intelligent Controllers	Includes the XA600 series base units.

The Customary Practices Outlined in the Manual

Due to space constraints, the manual may use certain abbreviations in place of the original full names; these potential names are listed in the table below for your reference.

Abbreviation	Explain
XA600 series	XA600 Series Industrial Intelligent Controllers
peripheral device	A collective term for programming software, human-machine interfaces, network modules, and other devices.
programming software	Xinje Controller Editing Tool Software (Abbreviation)

Related Manual

This manual covers only the hardware aspects of the XA600 series industrial intelligent controllers; for applications in other areas, please refer to the relevant technical documentation. The following list contains the relevant manuals for your reference.

Manual Name	Manual Introduction	Notes
Software Manual		
XD/XL/XG Series Programmable Logic Controller User Manual [Software Section] V3.8.1	Introduction to the usage methods and techniques of the Xinje XD and XL series PLC programming tool software	Electronic edition please request separately.
Instruction Manual		
XD/XL Series Programmable Logic Controller User Manual [Basic Instructions Section]	Introduction to the application of basic instructions in XD/XL series PLCs	Printed version and electronic version please request separately.
XD/XL Series Programmable Logic Controller User Manual [Positioning Control Section]	Introduces the application of pulse output and motion control instructions in XD/XL series PLCs.	Printed version and electronic version please request separately.
XDH/XLH/XG2 Series Programmable Logic Controller User Manual [Advanced Motion Control Section]	Introduces the usage of advanced motion control instructions for the XDH/XLH series PLCs.	Electronic edition please request separately..
Ethernet Communication Manual		
Ethernet Communication User Manual	Introduces the Ethernet communication functionality of Ethernet-based PLCs.	Electronic edition please request separately.

How to Obtain the Manual

Xinje Official Website Download
Website: en.xinje.com
Path: Service and Support - Download Center

1. Product Overview

1.1 Product Features

1) Model Specifications

The XA600 series of industrial intelligent controllers currently includes a single product model: the XA620-L.

- I/O points: 6 points
- Input type: NPN & PNP
- Output type: Transistor
- Power supply type: DC 24V

Series	Description
XA620-L	Features 6-pin specifications with 3-pin input and 3-pin output. Built on the XDPPro programming platform, it supports LD ladder logic, command-based programming, and ST structured text programming; it features a larger internal memory space. The XA620 main processor (i3-1215U) supports a maximum turbo frequency of 4.4 GHz and includes Ethernet communication and EtherCAT bus functionality, supporting up to 256 EtherCAT slave devices (up to 128 axes) and online firmware downloading. Running on the Linux operating system, this device can meet the majority of user requirements.

2) Powerful Functionality

The XA600 series of industrial intelligent controllers features comprehensive basic functions as well as a variety of specialized functions.

Core Functionalities

- High-speed Computation

The main processor in the XA600 series features a maximum clock speed of 4.4 GHz, meeting the demands of high-speed computing.

- Rich Extensions

The XA600 series is built on EtherCAT bus-based I/O expansion and can be integrated with DI/DO expansion modules, analog signal acquisition, and other specialized functional extensions.

- Multiple Communication Ports

The XA600 series features multiple communication interfaces, supporting RS232 and RS485 connections for interfacing with various external devices, LAN connectivity for local area network access, and EtherCAT communication.

- Ample Interior Space

XA600 series: up to 20,000 points of non-voltage-affected retention process S; 2,000 points of voltage-affected retention process HS; 200,000 points of non-voltage-affected retention intermediate relay M; 2,000 points of voltage-affected retention intermediate relay HM; 1,280 points of input relay X; 1,280 points of output relay Y; 20,000 points of non-voltage-affected retention timer T; 2,000 points of voltage-affected retention timer HT; 20,000 points of non-voltage-affected retention counter C; 2,000 points of voltage-affected retention counter HC; 2,000,000 points of non-voltage-affected retention data register D; 2,000,000 points of voltage-affected retention data register HD; 6,5535 points of FD.

- Multiple programming approaches

The XA600 series industrial PCs support three programming methods: Ladder Diagram (LD), Command Language, and Structured Text (ST).

● Rich instruction set

The instruction set is comprehensive, encompassing not only basic sequential control, data transmission and comparison, the four arithmetic operations, data cycling and shifting, but also supports specialized instructions such as PID.

● Real-time clock

The XA600 series industrial PCs feature a built-in PLC clock for time-based control.

● Easy installation

The XA600 series industrial PCs are easy to install – either by mounting directly onto a rail or by securing them with M3 screws.

Enhanced Special Features

● EtherCAT Bus

The XA600 series industrial PCs support the EtherCAT motion bus, enabling the synchronous control of up to 256 EtherCAT slave devices. For detailed instructions, please refer to the "XDH/XLH/XG2 Series Programmable Logic Controllers User Manual [Advanced Motion Control Edition]".

● Ethernet communication

The XA600 series industrial PCs support Ethernet communication, enabling faster and more stable program/data downloads as well as improved real-time performance. They also support PLC connectivity to the Internet, facilitating remote PLC discovery, online monitoring, and uploading/downloading operations. Additionally, these PCs support various protocols including Free-Format TCP, Modbus TCP, UDP, and Ethernet IP; for specific application details, please refer to the "Ethernet Communication User Manual."

● Free Switching of I/O Points

The XA600 series features GONGKONGJ's proprietary special function – a technology specifically developed for handling terminal damage – enabling normal operation without the need to modify any programming.

● C Language Editing Function Block

The XA600 series supports the use of C language to write function blocks, offering enhanced program confidentiality. Additionally, by leveraging the rich set of arithmetic functions available in C language, a wide range of functionalities can be implemented. This approach saves internal memory space and improves programming efficiency.

● POU Function

The XA600 series supports POU functionality, including Functions (FC), Function Blocks (FB), and Programs; users can write FCs and FBs using Ladder Diagrams, C Language, or Structured Text (ST), and then call them within the program.

● Built-in PID Function

The XA600 series industrial PCs feature PID control functionality and also support automatic tuning control.

● Download Online

The XA600 series industrial PCs feature an online download capability, enabling uninterrupted PLC operation.

3) Easy to Program

When programming the XA600 series industrial PCs using the XDPPro programming software, users

can clearly experience the software's user-friendly design and ease of use.

- ◆Ladder logic programming and Instruction List programming can be switched between them at any time for editing.
- ◆Features include soft component annotation, ladder diagram annotation, and command prompts.
- ◆An editing panel featuring a variety of special commands makes writing commands much more convenient.
- ◆Comprehensive monitoring modes: Ladder Diagram Monitoring, Free Monitoring, and Soft Component Monitoring.
- ◆Multiple window display for easier management.

For detailed information on software usage, please refer to the "XD/XL/XG Series Programmable Logic Controllers User Manual [Software Edition]".

1.2 Model Composition and Model List

The XA600 series industrial intelligent controllers are generally configured as follows:

XA – 6 2 0 – L

① ② ③ ④ ⑤

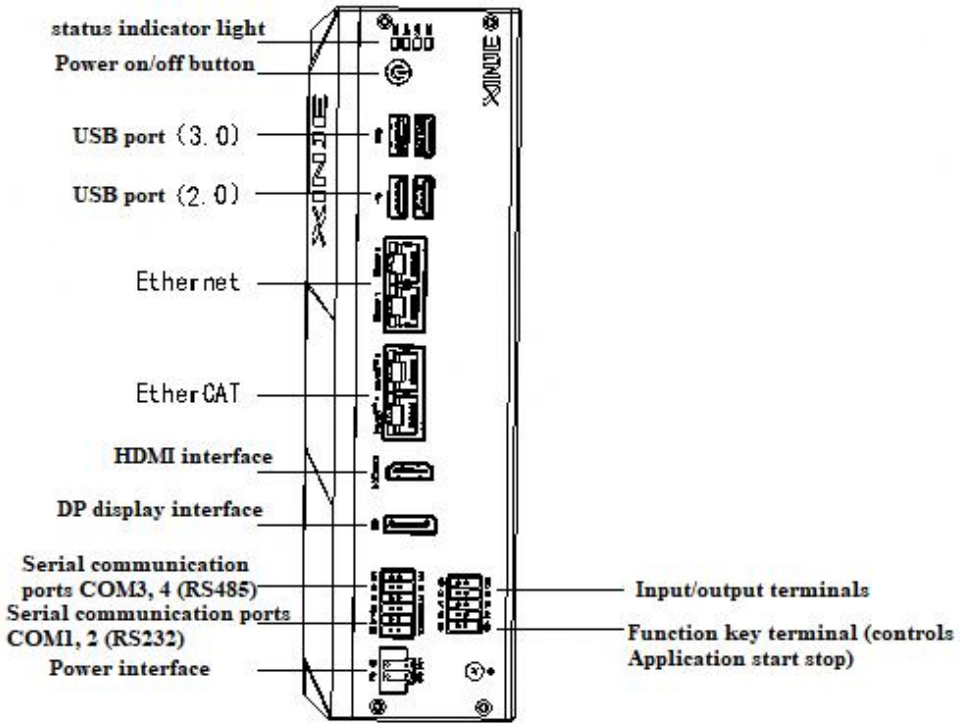
①	Product Series	XA:	XA Series Industrial Intelligent Controller
②	External Structure Code	6:	600 Series
③	Performance Grade	2:	Economical
④	Product Serial Number	0:	Product Serial Number
⑤	System	L:	Linux system

Controller Model List

Model	Product Description
XA620-L	Intel Core i3-1215U; 8 GB RAM; 256 GB HDD; 3X/3Y ports; 2 USB 2.0 ports; 2 USB 3.0 ports; 2 Ethernet communication ports; 2 EtherCAT communication ports; 2 RS232 interfaces; 2 RS485 interfaces; 1 DP interface; 1 HDMI interface; Linux operating system.

1.3 Section Descriptions

1.3.1 Structural Composition



1.3.2 LED Status Indicator

The XA600 series panel features four LED status indicators, as shown in the figure below:



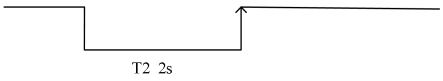
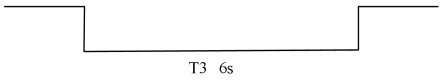
Icon	Color	Status Indicator	Indicator Light Status	Description
ERR	Red	Fault Indicating Light	Extinguish	The program in the controller is running normally.
			Always On	Controller program runtime exception
RUN	Green	Operating Indicating Light	Extinguish	The program has not been started or is in an incorrect state. (ERR indicator light stays on when an error occurs)
			Always On	The controller program is running normally.
SATA	Green	Hard Drive Detection	Extinguish	Hard drive anomaly or no data transfer
			Flash	Data is being transferred on the hard drive; the hard drive is operating normally.
PWR	Green	Power Supply Indicating Light	Extinguish	The external power supply or UPS is not supplying power, or there is an abnormal power supply condition.
			Always On	Either the external power supply or the UPS is operating normally.

1.3.3 Power Button

The XA620 series models feature a power switch button for manual powering on or off the controller.

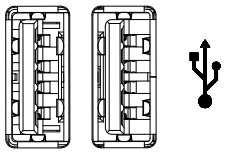


The power-on/off control logic is shown in the table below.

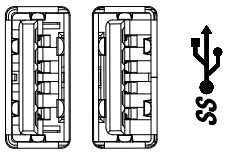
Explain	Control Logic Diagram
T1: Power-on (200 ms)	
T2: Power off (2s)	
T3: Forced shutdown (6s)	

1.3.4 USB Port

The XA620 features two USB 2.0 and two USB 3.0 ports, supporting plug-and-play and hot-plugging – allowing you to connect or disconnect external devices without powering off the device. It is compatible with common USB peripherals such as keyboards, mice, and USB flash drives. The USB 2.0 ports comply with the USB EHCI Rev. 2.0 specification; the specific pin definitions are as follows:



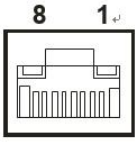
USB2.0		
Stitch	Signal Name	Function
1	VCC	Source
2	DATA-	Differential Data Signal
3	DATA+	
4	GND	Power Ground



USB3.0		
Stitch	Signal Name	Function
1	VCC	Source
2	DATA-	Differential Data Signal
3	DATA+	
4	GND	Power Ground
5	SSRX-	High-speed Reception of Differential Data Signals
6	SSRX+	
7	GND	Signal Ground
8	SSTX-	High-speed Differential Signal Transmission
9	SSTX+	

1.3.5 LAN Ethernet Interface

The XA620 features four Ethernet interfaces (2*Ethernet + 2*EtherCAT), supporting speeds of 10/100/1000 Mbps and complying with IEEE 802.3az. The ports utilize standard RJ45 connectors equipped with LED indicators that display the connection and transmission status.

	LED Indicator	
	Left Side LED	Right Side LED
	1000 Mbps: Green 100 Mbps: Orange	Yellow
	10 /100/1000 Link	Transmission Flicker

LAN Ethernet Port Pin Definitions

Pin	Signal (Ethernet 1000 Mbit/s)	Signal Direction	Description
1	TX_D1+	Output	Tranceive Data+
2	TX_D1-	Output	Tranceive Data-
3	RX_D2+	Input	Receive Data+
4	BI_D3+	+(Two-way)	Bi-directional Data+
5	BI_D3-	-(Two-way)	Bi-directional Data-
6	RX_D2-	Input	Receive Data –
7	BI_D4+	+(Two-way)	Bi-directional Data+
8	BI_D4-	-(Two-way)	Bi-directional Data-

1)Ethernet Port

Supports communication protocols such as Modbus-TCP and UDP. It can be used for downloading and uploading programs, online monitoring, remote monitoring, and more; it can also communicate with other TCP/IP devices within the local area network.

Project	Parameter
Transmission Medium	Ethernet Category 5, 5e or higher STP (Shielded Twisted Pair) cable
Communication Speed	Up to 1000 Mbps
Maximum Number of Network Nodes	30
Maximum Station Spacing	100 meters
Net Topology	Linear, Star, Daisy Chain, Branching
Media Access Method	CSMA/CD

2)EtherCAT Port

Designed for EtherCAT bus control, control cycle ≤ 1 ms.

Project	Specifications
Communication Standards	IEC61158 Type12
Physical Layer	100BASE-TX（IEEE802.3）
Baud Rate	1000[Mbps]（full duplex）
Topology	Linear, Star,Chrysanthemum Chain, Branching, Circular
Tie Cable	JC-CB twisted pair cable (shielded twisted pair cable)
Cable Length	Maximum distance between nodes: 100 m
Communication Port	2Port（RJ45）
EtherCAT Indicators（LED）	[Run] RUN Indicator [L/A IN] Port0 Link/Activity Indicator（Green） [L/A OUT] Port1 Link/Activity Indicator（Green）
Station Alias（ID）	Range: 0–65535
Explicit Device ID	Not support
SyncManager	4
FMMU	3
Touch Probe	Channel 2
Synchronous Mode	DC (SYNCO Event Synchronization) SM (SM Event Synchronization)
Cyclic Time (DC Communication Cycle)	250，500，1000，2000，4000，8000，10000[μs]

Project	Specifications
Communication Partner	SDO [Service Data Object], PDO [Process Data Object]
Maximum PDO Allocation per Station	TxPDO + RxPDO ≤ 1434 bytes
Maximum PDO Allocation Count for all Subordinate Devices	TxPDO + RxPDO ≤ 11,472 bytes
PreOP Mode - Email Communication Interval	Not support
E-Mail	SDO Request and SDO Information
EtherCAT Slave Count	Supports up to 256 slave devices, with up to 128 axes supported.
Synchronous Control Cycle Ultimate Performance	250 μs, 16 slave devices 500 μs, 64 slave devices 1 ms, 128 slave devices 2 ms, 256 slave devices
Ethercat Redundancy※	Support (the EtherCAT port 1 is a redundant port)

[Note]:

※1: ① The EtherCAT redundancy function is disabled by default. To enable this function, go to the programming software → EtherCATMaster → PLC Master → Master Station Configuration → Check "Add Redundancy Information".

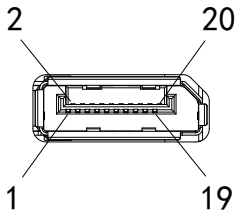
② The EtherCAT ring network redundancy function does not support splitters.

1.3.6 Video Interface

The XA620 series industrial PCs feature two high-definition display interfaces (one DP++ display interface and one HDMI interface), supporting high resolution and high refresh rates.

1)DP++ Interface

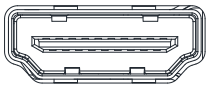
The XA620 series industrial PCs feature a DP++ dual-mode display interface, which supports outputting HDMI and VGA signals via an adapter, making them compatible with display terminals supporting various interface specifications. This interface supports a maximum resolution of 4096×2304 @ 60 Hz, enabling high-speed, high-definition signal transmission while offering excellent interference resistance. The interface is shown in the figure below:



Stitch	Signal Name	Function	Stitch	Signal Name	Function
1	ML_Lane 0(p)	Channel 0 Real Signal	11	GND	Grounding
2	GND	Grounding	12	ML_Lane 3(n)	Channel 3 Auxiliary Signal
3	ML_Lane 0(n)	Channel 0 Auxiliary Signal	13	GND	Grounding
4	ML_Lane 1(p)	Channel 1 Real Signal	14	GND	Grounding
5	GND	Grounding	15	AUX_CH(p)	Affiliated Channel Real Signal
6	ML_Lane 1(n)	Channel 1 Auxiliary Signal	16	GND	Grounding
7	ML_Lane 2(p)	Channel 2 Real signal	17	AUX_CH(n)	Affiliated Channel Auxiliary Signal
8	GND	Grounding	18	Hot Plug	Hot-swapping Detection
9	ML_Lane 2(n)	Channel 2 Auxiliary Signal	19	DP_PWR Return	Joint Power Supply Response
10	ML_Lane 3(p)	Channel 3 Real Signal	20	DP_PWR	Joint Power Supply

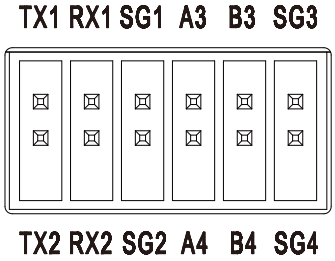
2)HDMI interface

The XA620 series industrial PCs feature a built-in HDMI display interface, enabling high-definition video output at up to 4096×2160 @ 30 Hz.



1.3.7 Serial Communication Interface

The XA620 features a single 12-pin plug-in COM interface; its serial ports support optical coupling isolation, providing a total of four communication serial ports (2 RS-232 ports + 2 RS-485 ports).

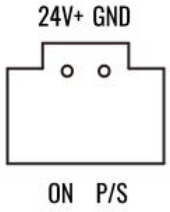


Series	Serial Port Type and Pin Mapping			
	COM1 (RS232)	COM2 (RS232)	COM3 (RS485)	COM4 (RS485)
XA620	TX1、RX1、SG1	TX2、RX2、SG2	A3、B3、SG3	A4、B4、SG4

- The RS232 interface uses full-duplex communication, while the RS485 interface uses half-duplex communication.
- RS232 wiring: Connect RX to the TX terminal of the remote communication device; connect TX to the RX terminal of the remote communication device; connect SG to the GND terminal of the remote communication device.
- RS485 wiring: Connect A to the 485+ (A) terminal of the remote communication device; connect B to the 485- (B) terminal of the remote communication device; connect SG to the GND terminal of the remote communication device.

1.3.8 Power Input Interface

The XA620 series is equipped with a single 24V 4-PIN plug-in terminal block, as shown in the figure below:



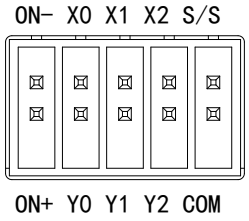
Signal Name	Function
24V+	Connect to a 24V+ DC Power Supply.
GND	Connect to DC Power Supply (0 V)
ON	PC_ON 3V Output
P/S	24V/500mA Output

Terminal Connection Instructions:
① 24V+ and GND: Industrial PC power supply;
② ON & GND: Used for powering on or off the industrial PC – same effect as pressing the power button;
③ P/S and GND: The P/S supplies a 24 V power supply; when connected to the load and GND, it forms a circuit with a maximum current of 500 mA.

1.3.9 Function Key Terminal

The XA620 series I/O terminal blocks feature ON+ and ON-function key terminals. The controller continuously monitors the status of these terminals under normal operating conditions, enabling the start and stop of user programs. In the event of abnormal situations—such as program faults or failure to

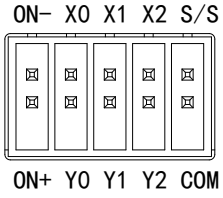
establish a proper connection with the host computer—short-circuiting the ON+ and ON-terminals will halt the execution of the user program; disconnecting these terminals will restart the user program.



Scene Classification	ON+、ON- Terminal Status	User Program Status	RUN Indicator Light Status	Supplementary Specification
Upon Power-on Real-time Control	Short Circuit	Stop Running Immediately	Extinguish	Under short-circuit conditions, the user program cannot be started using the programming software.
	Break	Start Immediately	Always On	Controller program has been restored to operation.
Power-on Initial Detection	Short Circuit	Don't Start, Maintain the Stop State.	Extinguish	All Ethernet and EtherCAT ports on the controller are configured with default IP addresses; after disconnecting and shorting the ports, the user program will remain in a stopped state. To resume program execution, you can either operate the host computer or, after powering on the device, reconnect and disconnect the ON+ and ON– terminals to switch the device to the running mode.
	Break	Normal Startup, Entered Run State	Always On	All communication ports of the controller operate according to parameters configured by the user.

1.3.10 I/O Terminal

The XA620 series models feature a 3-input/3-output digital I/O interface, which can be used for signal acquisition and triggering functions. The interface is shown in the figure below:



2. Controller Specifications

2.1 Technical Specifications

2.1.1 General Requirements

Project		XA620
Running Temperature	Maximum Temperature	55℃
	Minimum Temperature	-20℃
Transport/Storage Temperature	Maximum Temperature	70℃
	Minimum Temperature	-40℃
Ambient Humidity (Run/Store)	Upper Bound	95%
	Lower Limit	10%
Levels of Protection		IP20
Anti-vibration		Complies with IEC 61131-2 Under intermittent vibration (frequency: 5–9 Hz; constant amplitude: 3.5 mm peak displacement) and (frequency: 9–150 Hz; constant acceleration: 1.0 g peak acceleration) Continuous vibration (frequency: 5–9 Hz; half-amplitude: 1.75 mm displacement) and (frequency: 9–150 Hz; constant acceleration: 0.5 g; constant frame rate) The scanning is performed 10 times in each of the X, Y, and Z directions.
Shock Resistance		Complies with IEC 61131-2 standard Impact intensity: 15 g (peak); duration: 11 ms; applied to each of the three mutually perpendicular axes; each axis is subjected to three impacts (total of 18 impacts).
Service Environment		Non-corrosive gases
Elevation Usage		0–2000 m
Overvoltage Level		II: Complies with IEC 61131-2
Pollution Level		2: Complies with IEC 61131-2
Anti-interference EMC		Complies with IEC 61131-2 and IEC 61000-6-4 Class B
Related Certification		CE

2.1.2 Performance Requirement

Project		Specifications
Program Execution Method		Cyclic scanning mode
Programming Approach		Combination of instructions and ladder diagrams
Processing Speed		0.01~0.03us
Power Outage Maintenance		Built-in UPS
User Program Capacity※1		4MB
I/O Points※2	Total Points	6 points
	Input Points	3 points: X0-X2

Project		Specifications	
	Output Points	3 points: Y0-Y2	
Internal Coil (X)※3		1280 points	X0~X77、X10000~X11777、X20000~X20177、X30000~X30077
Internal Coil (Y)※4		1280 points	Y0~Y77、Y10000~Y11777、Y20000~Y20177、Y30000~Y30077
Internal Coil	Typically Uses M	200,000 points	M0~M199999
	Power Outage Maintenance HM	20,000 points	HM0~HM19999
	Special Use: SM※5	50,000 points	SM0~SM49999
Flow Path	Typically Uses S	20,000 points	S0~S19999
	Power Outage Maintenance – HS	2000 points	HS0~HS1999
Timer	Typically Uses T	20,000 points	T0~T19999
	Power Outage Maintenance – HT	2000 points	HT0~HT1999
	Precision Timing ET	40 points	ET0–ET39 (For internal use only; precise timing functionality is not supported)
	Specifications	100 ms timer: Set time range: 0.1–3276.7 seconds 10 ms timer: Set time range: 0.01–327.67 seconds 1 ms timer: Set time range: 0.001–32.767 seconds	
Counter	Generally Uses C	20,000 points	C0~C19999
	Power Outage Maintenance HC	2000 points	HC0~HC1999
	High-Speed Counterhsc HSC	40 points	HSC0–HSC39 (For internal use only; high-speed counting functionality is not supported)
	Specifications	16-bit counter: Settable range: K0–32,767 32-bit counter: Set range –2147483648 to +2147483647	
	Usually Denoted As D	2,000,000 points	D0~D1999999
	Power Outage Maintenance – HD	2,000,000 points	HD0~HD1999999
	Special Use: SD※5	50,000 points	SD0~SD49999
	Special Power Outage Maintenance Mode – HSD※5	50,000 points	HSD0~HSD49999
	Power Outage Maintenance FD	65,536 points	FD0~FD65535
	Special Use SFD※5	65,488 points	SFD0~SFD65487
	Special Confidential Register FS	48 points	FS0~FS47
Wait Instruction Special Coil		32 points	SEM0~SEM31
High-Speed Section Logical Functionality	High-Speed Counting	Not support	
	Pulse Output	Not support	
	External Interrupt	Not support	
Password Protection		6-bit ASCII	
Self-Diagnostic Function		Power-on self-test, monitoring timer, syntax check	
Ethernet Port Communication Functionality※7	Modbus TCP	Client: Supports up to 64 connected servers. (32 command configurations, 32 graphical configurations) Server: Supports up to 32 connected clients.	
	Free-Formattcp	Maximum number of network nodes: 32	
	UDP Unicast	Maximum number of network nodes: 32	
	UDP Multicast	Maximum number of network nodes: 32	

Project		Specifications
	Ethernet IP	Supports implicit communication and display communication Implicit communication: Supports scanners and adapters Scanner (Main Station): Maximum of 128 slave stations can be connected. Adapter (Slave Device): 256 input (O->T) + output (T->O) channels Explicit Communication: Supports both client and server modes Client: Supports up to 32 connected servers. Server: Supports up to 16 connected clients.
Ethercat Communication Functionality	Ethercat Slave Count	Supports up to 256 slave devices, with up to 128 axes supported (EtherCAT port 0).
	Synchronous Control Period Extreme Performance	250 μs; 16 slave devices 500 μs; 64 slave devices 1 ms, 128 slave devices 2 ms, 256 slave devices
	Erhercat Redundancy※8	Support (the EtherCAT port 1 is a redundant port)

[Note]:

※1: User Program Capacity – refers to the maximum program capacity for secure downloads.

※2: I/O points – refers to the number of terminals available for users to connect external input or output signals to.

※3: X refers to the internal input relay; when X exceeds the I-point count, it may be used as an intermediate relay.

※4: Y denotes the internal output relay; when the value exceeds point O, the Y relay can be used as an intermediate relay.

※5: Special-purpose registers – refers to registers reserved by the system for specific purposes and cannot be used for any other purpose; for details, please refer to Appendix 1.

※6: The numbers assigned to input coils and output relays/transistors are in octal notation; the numbers assigned to all other memory devices are in decimal notation.

※7: When communication is implemented using protocols, there are up to 32 TCP protocols, including Free-Format TCP and Modbus TCP; there are up to 32 UDP protocols, including UDP Unicast and UDP Multicast.

※8: ① The EtherCAT redundancy function is disabled by default. To enable this feature, go to the programming software → EtherCATMaster → PLC Master → Master Station Configuration → Check "Add Redundancy Information";

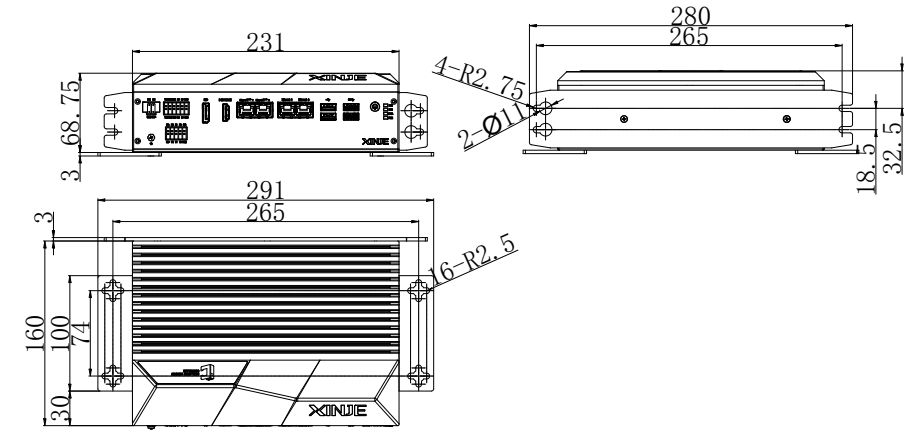
② When the EtherCAT ring topology redundancy function is enabled, the bus link cannot be connected to a splitter.

2.1.3 Factory Specifications

Project		XA Specifications
		XA620
CPU	Model	I3-1215U
	Basic Frequency	4.4GHz
	Core	6-core processor
Memory	DDR4	8 GB
Hard Drive	M.22280	256GB
Communication Port	LAN	2*Ethernet + 2*Ethercat
	USB	2*USB 2.0 + 2*USB 3.0
	COM	4*COM（RS232*2；RS485*2）
Display	DP++	Maximum resolution: 4096 x 2304 @ 60Hz
	HDMI	Supports up to 4096 x 2160 @30Hz resolution

2.2 Size

unit(mm)



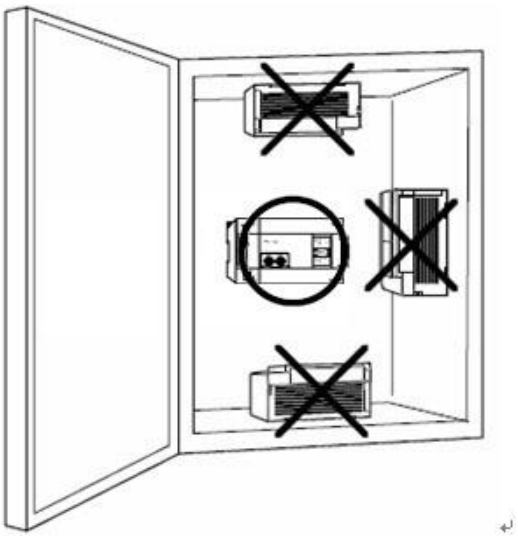
Applicable Device Models
XA620

2.3 Product installation

2.3.1 Installation Environment

Install the product under the environmental conditions specified in Section 2.1.1 – General Requirements.

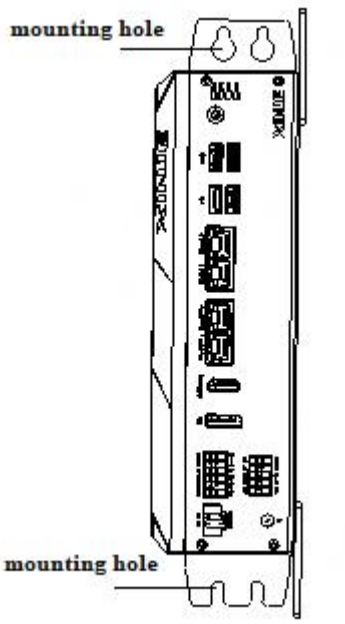
2.3.2 Installation Site



2.3.3 Method of Installation

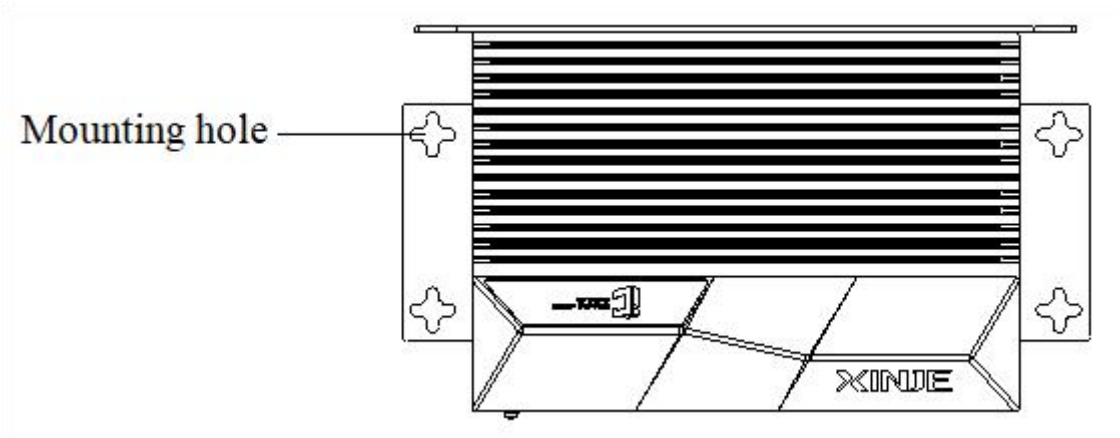
The XA620 series can be installed using either a backplane or side mounting brackets.

1) Backplane Installation



Install using four screws; this method is suitable for vertical installation.

2) Side mounting lug installation

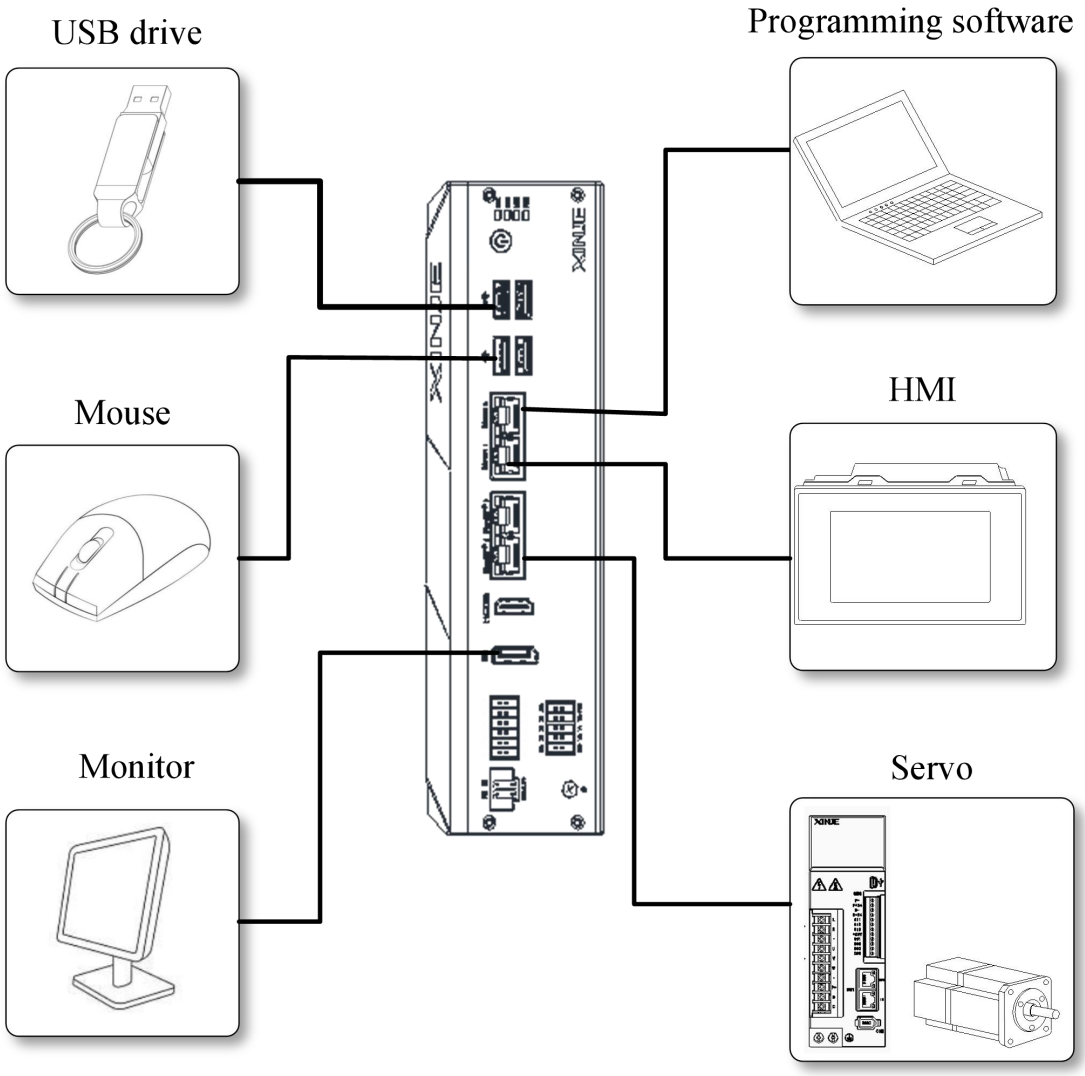


Install using four screws. The installation direction can be adjusted as needed.

3. System Architecture

3.1 System Topology

The diagram below illustrates the system architecture based on the basic configuration of the XA620 series. This diagram provides a general overview of the connection topology between the PLC and its peripheral and expansion devices, as well as typical applications of the PLC's various communication, connection, and expansion interfaces.



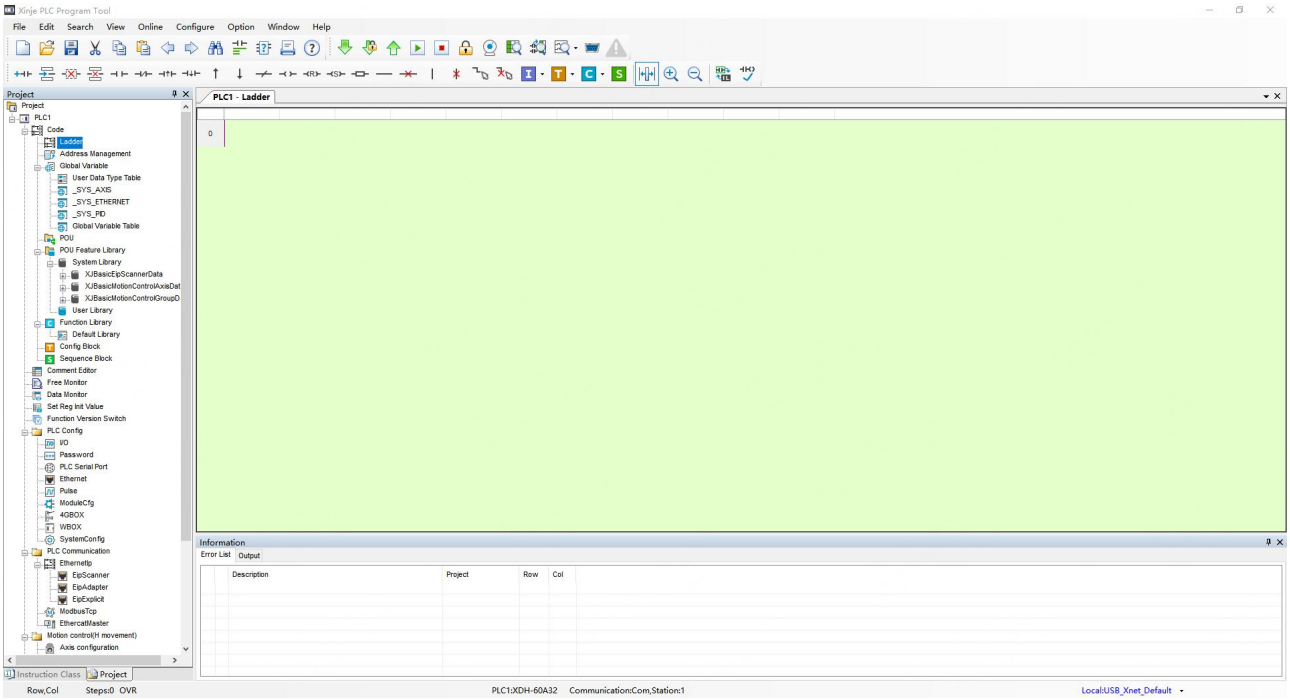
3.2 Peripheral Device

The use of the XA600 series industrial intelligent controllers involves a variety of peripheral devices.

3.2.1 Programming Software

The programming software enables functions such as writing or uploading programs to the controller, monitoring the controller's operation in real time, and configuring the controller. After installing the "XINJE PLC Programming Tool Software" on your personal PC, connect the controller to the programming software using an Ethernet cable through the industrial intelligent controller's Ethernet port.

Programming software interface



3.2.2 Human-computer Interface

The human-machine interface (HMI) is the interface that enables interaction between the controller and the operator. It allows operators to send their commands to the controller conveniently and swiftly, which then executes those commands.
The basic unit of the XA600 series controller supports the connection of various human-machine interfaces; these connections are established on the basis of a consistent communication protocol—typically the Modbus protocol—is used, with specific parameters depending on the particular human-machine interface being connected.
Xinje Company's Human-Machine Interfaces (HMI) can communicate directly with the base unit (the communication parameters are already aligned). Currently, Xinje's HMI products are available in the TS and TG series (touchscreen models) and the OP series (text display models).

1)TS、TG Series

- Size: 4.3 ", 7", 8 ", 10.1", 15.6"
- Displays: 16,770,000 colors、65,536 colors
- Operation: Display Area Touch Interaction
- Communication Port: RS232, RS422, RS485, USB, and Ethernet interfaces
- Communication:

  Direct communication is supported with XINJE frequency converters, various controllers,

frequency converters, and instruments.
Direct-drive panel printer – supports multiple printer models
Equipped with dual ports, allowing simultaneous connection of two different devices.
Supports free-format protocols, allowing users to freely write drivers.

- Formula: Chinese character input – allows direct entry of Chinese characters.
- An extensive 3D image library, text effects, data collection, data backup, and more.
- Password – Level 9 Access Privilege Settings
- Advanced: Open-ended advanced features, animated trajectory design, etc.

2) OP Series

- Size: 3.7"
- Display: STN-LCD
- Button: 7, 20 buttons; touchscreen screen not available
- Communication Port: RS232, RS485, RS422
- Communication:
  Direct communication with multiple controllers
  Direct communication with the Xinje frequency converter
- Clock: Can be built-in

4. Power Supply Specifications and Wiring Method

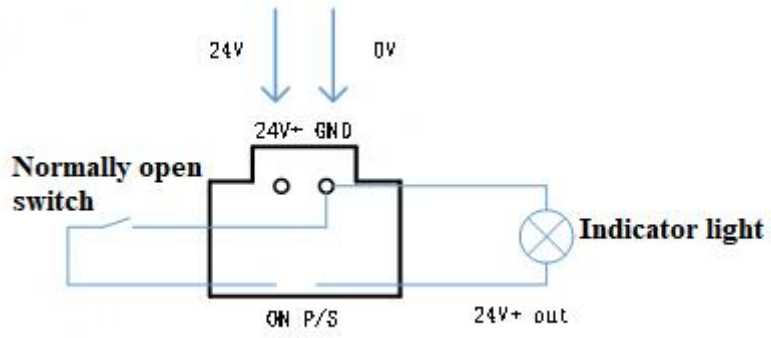
4.1 Power Supply Specifications

The XA620 series power supply specifications are as follows:

Project	Content
Rated Voltage	DC24V
Voltage Allowable Range	DC 19.2V~28.8V
Input Current (Only for Basic Units)	120mA
Allowable Instantaneous Power-Off Duration	10ms DC24V
Impact Current	10A DC26.4V
Maximum Power Consumption	120W

4.2 Power Supply Wiring

The wiring method for the XA600 series power supplies is as follows:



- 24V+ and GND: Industrial PC power supply. When these two terminals receive a stable external 24V power supply, the industrial PC can be properly powered on and operated.
- ON/GND: For powering on or off an industrial PC; same effect as pressing the power button.
- P/S and GND: The P/S supplies a 24 V power supply. The P/S connects to the load and GND to form a circuit; the maximum current is 500 mA.

For the ON and GND power on/off control logic, refer to Section 1.3.3 Power Button.

5. Input Specifications and Wiring Method

The XA620 series industrial PCs are equipped solely with standard digital input ports and do not support high-speed input functionality; their detailed technical specifications and wiring instructions are provided below.

5.1 Input Specification

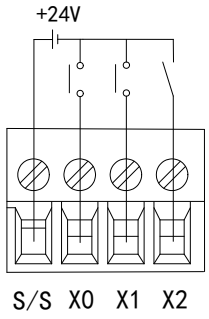
The input specifications for the XA620 series industrial PCs are as follows:

Project	Content
Enter Point	X0~X2
Input Signal Voltage	DC24V±10%
Input Signal Current	6mA/DC24V
ON Current Input	2.5mA
OFF Current Input	1mA
On Voltage Input	11V
Off Voltage Input	5V
Input Response Time	ON->OFF: Within 2 ms
	OFF → ON: Within 2 ms
Input Signal Format	Collector NPN or PNP input
Circuit Insulation	Optoelectronic coupling insulation

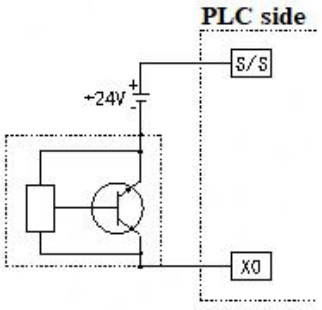
5.2 Input Wiring Method

The wiring method for the input terminals of the XA620 series industrial PCs is as follows:

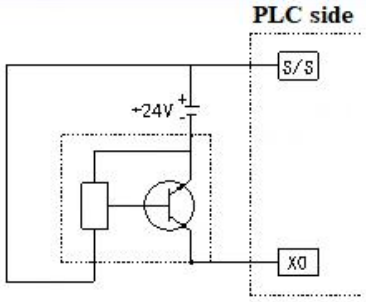
- NPN pattern



Switch Button Wiring Diagram Example

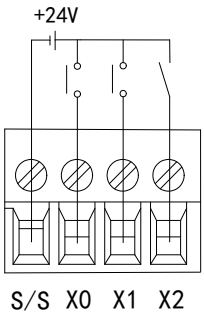


Example of a two-wire (NPN-type) proximity switch wiring diagram;

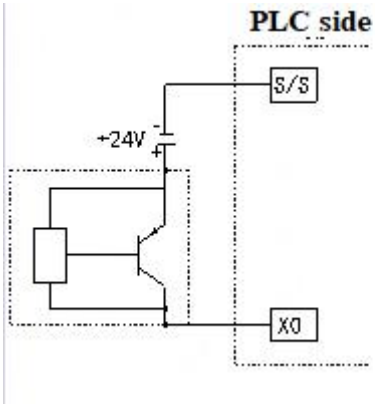


Example of a three-wire (NPN-type) proximity switch wiring diagram

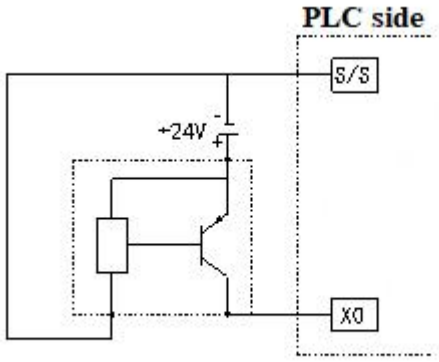
- PNP pattern



Switch Button Wiring Diagram Example



Example of a two-wire (PNP-type) proximity switch wiring diagram;



Example of a three-wire (PNP-type) proximity switch wiring diagram;

6. Output Specifications and Wiring Method

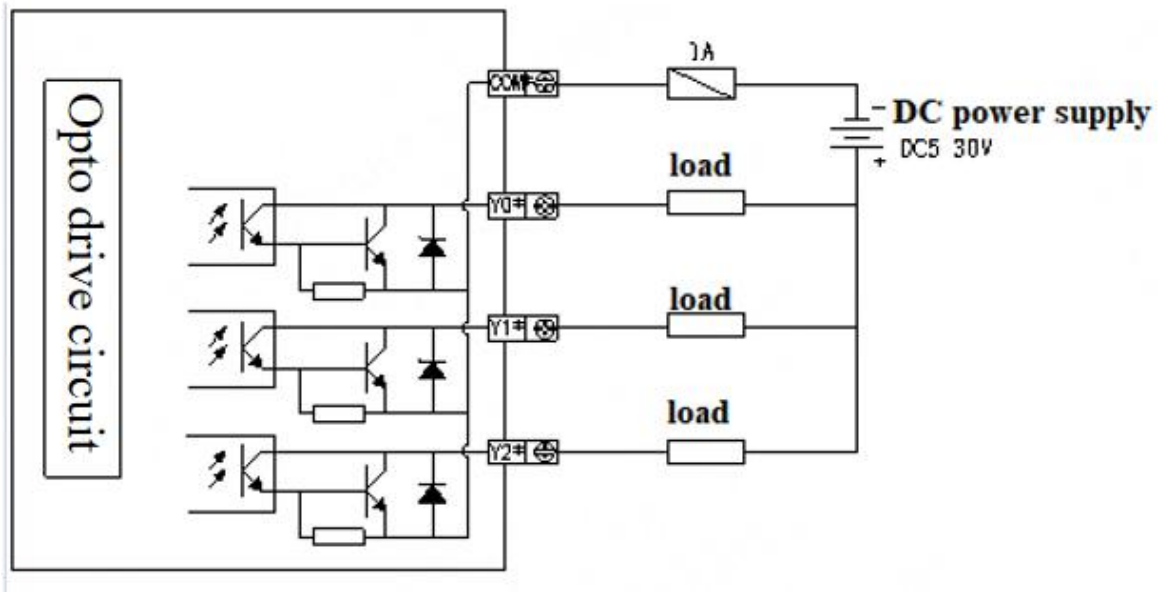
6.1 Output Specifications

The output specifications for the XA620 series industrial PCs are as follows:

Project		Specifications
Output Point		Y0-Y2
Maximum Output Load Voltage		DV24V±10%
Nominal Maximum Load Current		100mA/DC24V
Short-circuit Protection Current		200mA
Output Response Time	ON->OFF	Within 2 ms
	OFF->ON	Within 2 ms
Output Signal Format		Drain electrode
Circuit Insulation		Optoelectronic coupling insulation
Output Protection		Supports short-circuit and overload protection functions

6.2 Output Wiring Method

An example of wiring for the output terminals of the XA620 series industrial PC is as follows:



7. BIOS Settings

7.1 BIOS Explain

BIOS is a basic input/output control program stored in Flash Memory. Acting as a bridge between the mainboard and the operating system, it is responsible for managing relevant parameter settings of the mainboard and expansion cards. When the controller is activated, the BIOS program takes control first and executes POST (Power-On Self-Test). It detects all hardware devices and verifies synchronized hardware parameters. Once all tests are completed, it hands over system control to the Operating System (OS).As BIOS serves as the sole communication channel between hardware and software, proper configuration of BIOS parameters determines whether your computer runs stably and operates under optimal conditions. Therefore, correct BIOS settings are critical to system stability and ensure maximum system performance.

The CMOS Setup utility stores all configured settings in the motherboard's built-in CMOS SRAM. When the power is turned off, the lithium battery on the motherboard continues to supply power to the CMOS SRAM. The BIOS Setup utility allows you to configure:
(1) Hard Disk Drives and Peripheral Devices
(2) Video Display Type and Display Options
(3) Password Protection
(4) Power Management Features



As the motherboard BIOS version is continuously being updated, the descriptions of the BIOS in this manual are for reference only.
We do not guarantee that the information contained in this manual is consistent with the information you have received.

7.1.1 Enter CMOS Setup

When the controller starts up, BIOS enters the POST (Power-On Self-Test) routine. The POST routine consists of a set of diagnostic programs embedded in BIOS. If no errors are encountered after POST completes, press the DEL key or ESC key to enter BIOS setup until the BIOS interface appears.If this message disappears before you respond, power off and restart the controller. Alternatively, press <Ctrl> + <Alt> + <Delete>simultaneously to perform a warm reboot.

7.1.2 Function Keys and Additional Instructions

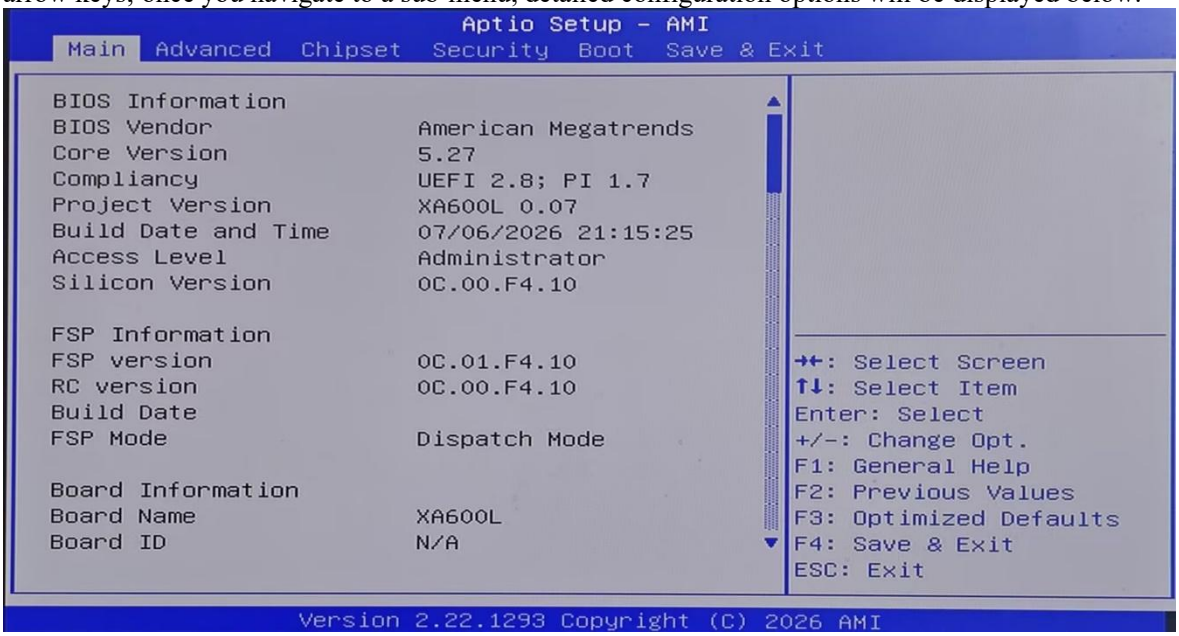
Function Key	Explain
↑ (Up Arrow Key)	Use to move to the previous item
↓ (Down Arrow Key)	Use to move to the next item
← (Left Mouse Button)	For items to be moved to the left
→ (Right-Click)	For items to be moved to the right
Esc key	Use to exit the current screen.
Enter key	For selection confirmation
+Key	Used to change the set state or add numerical values.
-Key	Used to change the set state or reduce numerical values.
F1 Key	For displaying help
F2 Key	Used to load a pre-set value.
F3 Key	Value for load optimization
F4 Key	Used to store setpoint values and exit the CMOS SETUP program.

- Main Screen Auxiliary Instructions

  When you are on the Setup main screen, as you scroll through the options, the corresponding primary settings are displayed below.
  To close the Help window, simply press the [ESC] key.

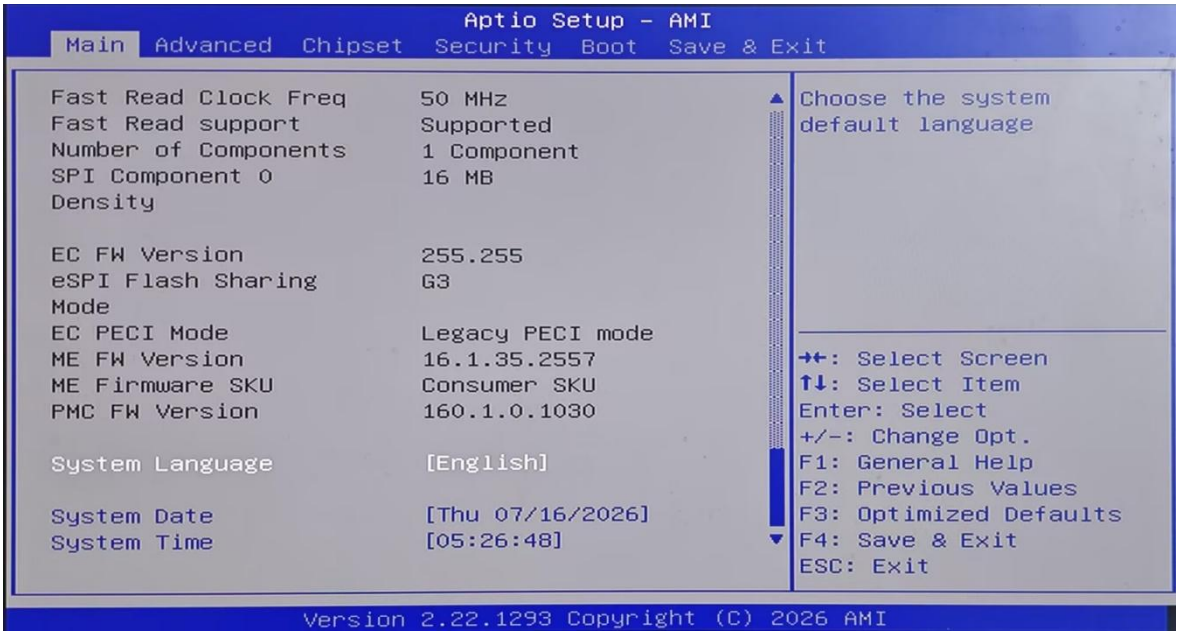
7.2 Main Menu Functionality

When you enter the CMOS Setup menu, you will see the main menu shown in the figure above on the screen. From this main menu, you can select various configuration options by pressing the left or right arrow keys; once you navigate to a sub-menu, detailed configuration options will be displayed below.



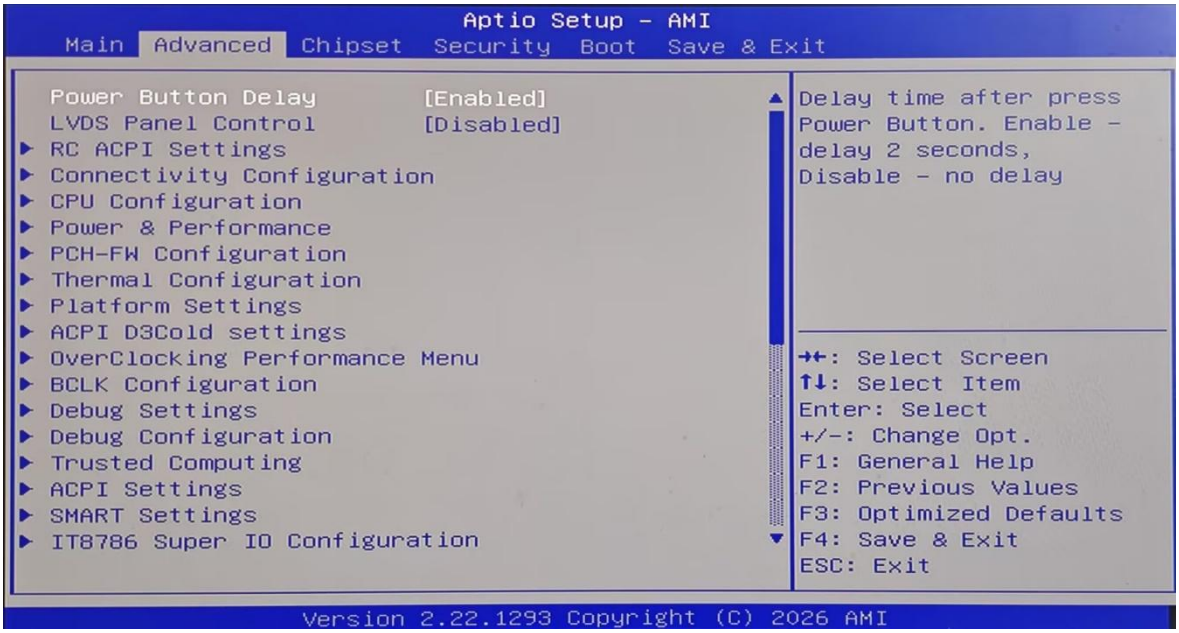
- Main (Standard CMOS Settings): Set date, time, and other parameters;
- Advanced (Advanced BIOS Configuration): Configure special BIOS features, such as CPU, USB, PCI, network port, etc.;
- Chipset Performance Settings: Configure device options such as North Bridge and South Bridge;
- Security (Set administrator/user passwords);
- Boot (Boot Configuration Feature);
- Save & Exit (Save & Exit Options): This option includes actions such as Discard Changes/Do Not Save and Exit/Save and Exit, among others.

7.3 Main (Standard CMOS Configuration)



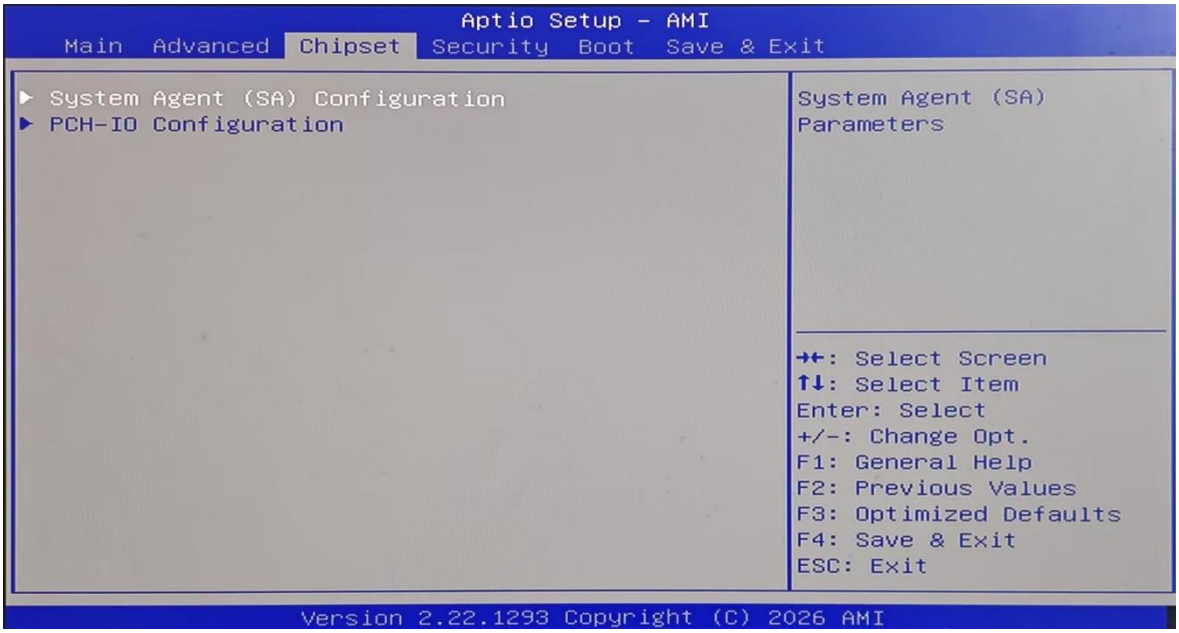
- System Language: Set the language for your computer;
- System Date (mm:dd:yy) (Date Settings): Set the date on your computer in the format "Week/Month/Day/Year";
- System Time (hh:mm:ss) (Time Settings): Set the time on your computer in the "hours/minutes/seconds" format.

7.4 Advanced BIOS Settings



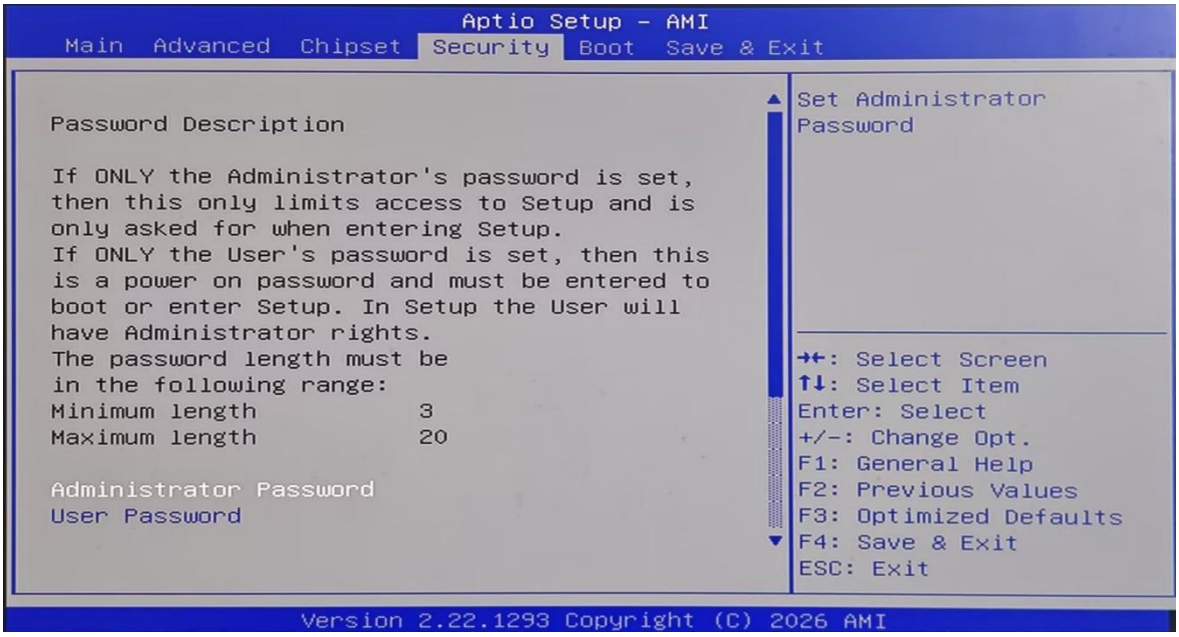
- Trusted Computing: Trusted Computing
- ACPI Settings: ACPI Configuration
- SMART Settings: Smart Settings
- Super IO Configuration: Advanced IO Port Configuration
- Watchdog Configuration: Watchdog Settings
- CPU Configuration: CPU Configuration
- PCI Subsystem Settings: PCI Subsystem Configuration
- USB Configuration: USB Configuration
- Network Stack Configuration: Network Stack Configuration
- CSM Configuration: CSM Configuration
- NVMe Configuration: NVMe Configuration
- SDIO Configuration: Secure Digital I/O Port Settings
- Platform Trust Technology: Platform Trust Technology
- Security Configuration: Security Settings
- Thermal: Heat
- System Component: System Component
- FPGA Configuration: FPGA Configuration
- Debug Configuration: Debugging Settings
- RC ACPI Settings: RC ACPI Configuration
- RTD3 Settings: RTD3 Configuration

7.5 Chipset Performance Settings



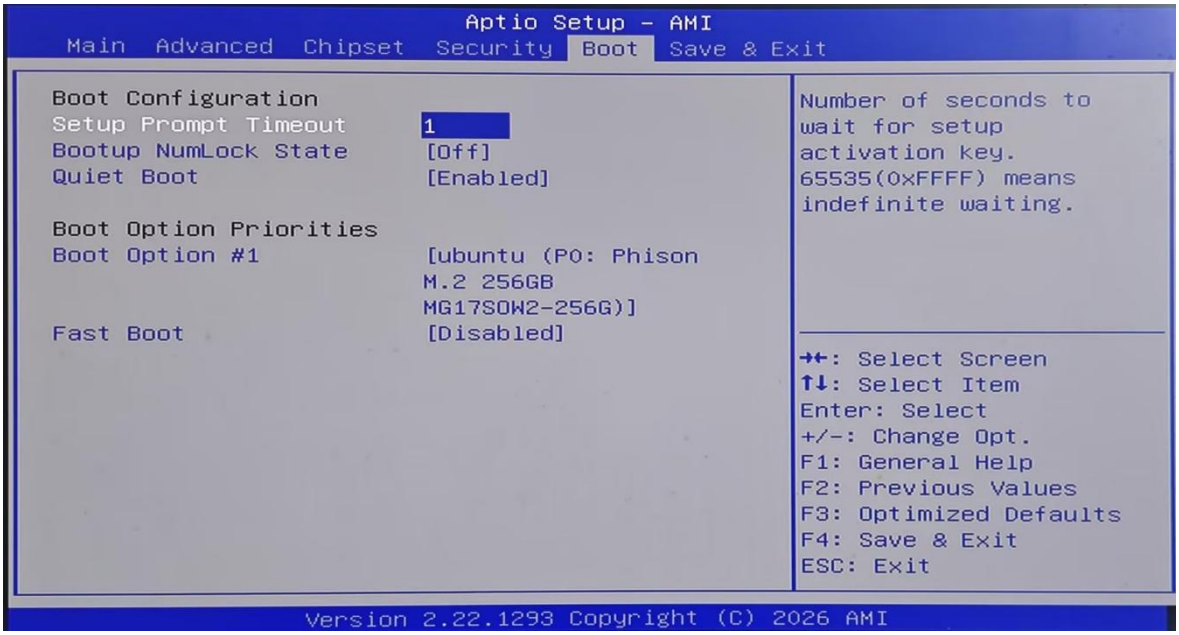
- North Bridge: Configuration
- South Bridge: South Bridge Configuration
- Uncore Configuration: Uncore Configuration
- South Cluster Configuration: South Cluster Setup

7.6 Security (Set Administrator/User Password)



- Set Administrator Password: Configure the superuser password option; this password grants the highest level of access.
  When you select this feature, the following information will appear: Crate – New Password ******
  Enter a password (up to 20 characters), then press the <Enter> key. The BIOS will then prompt you to re-enter the same password; once the password is entered, the BIOS will save it. Once the password protection feature is enabled, you will be required to enter a password every time you enter the BIOS setup menu. This helps prevent unauthorized individuals from accessing your controller.
- User Password: Configure the user password option; this password-based access is restricted, and certain settings cannot be modified.
  When you select this feature, the following information will appear: Crate – New Password ******
  Enter a password (maximum 20 characters), then press the <Enter> key. The BIOS will then prompt you to re-enter the same password; once the password is entered, the BIOS will save it. Once the password feature is enabled, you will be required to enter a password every time you enter the BIOS setup menu.
- Secure Boot: Secure Boot settings.

7.7 Boot (Boot Configuration)



- Boot Configuration

  Setup Prompt Timeout: Set the prompt duration
  The POST wait time displayed upon startup – the higher the value, the longer the wait time.
  Bootup NumLock State: The state of the Num Lock key after system startup
  Setpoints: [On]/[Off]. This option specifies the state of the Num Lock key on the keyboard after the controller is powered on.
  Quiet Boot: Quiet Startup

  Setpoint options: [Disabled]/[Enabled]. This option determines whether the LOGO should be displayed when the controller is started.

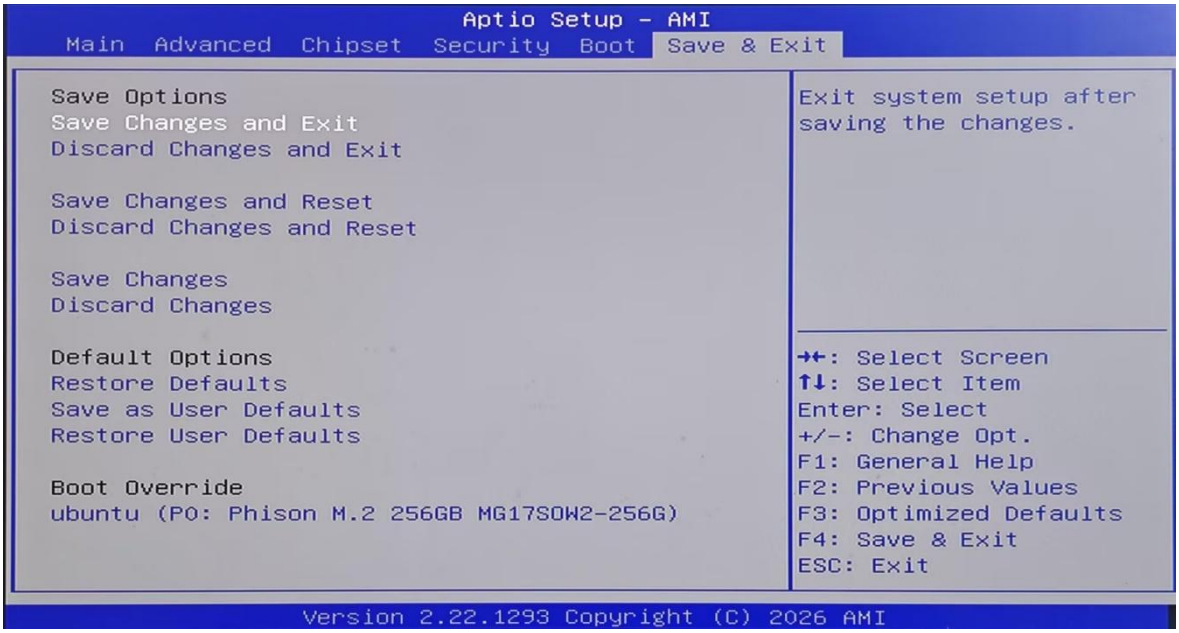
- Boot Option Priorities: Priority Boot Options

  Boot Option #1: The first boot option. Use this option to specify which disk to use for booting.
  Fast Boot: Quick Startup

  Setpoint options: [Disabled]/[Enabled]. This option determines whether a hardware self-test should be performed upon system startup.

- New Boot Option Policy: New Boot Strategy

7.8 Save & Exit (Save & Exit Options)



- Save Options

  Save Changes and Reset: Save changes and restart

  Discard Changes and Reset: Discard changes and restart

- Default Options

  Restore Defaults: Load Default Optimization Values (Load Optimal Defaults)
  This option in the main menu allows users to restore all BIOS settings to their optimized values. The optimized default settings are designed to maximize motherboard performance; by selecting YES and pressing Enter, all configuration changes will be saved to the CMOS SRAM, and the BIOS setup program will close automatically. If you do not wish to save the settings, simply select NO to return to the main menu.
  Save as User Defaults: Save with user-default settings

  Restore to User Defaults: Restore to user-default settings

- Boot Override: Direct Boot Configuration

8. Operation, Debugging, Maintenance

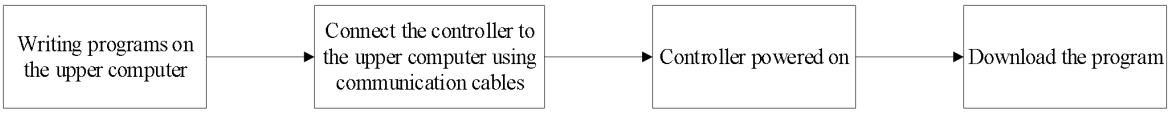
8.1 Operation and Debugging

1)Product Inspection

Upon receiving the product, please first check whether the product's input and output terminal blocks are intact and whether any components are missing. Generally, the controller can be directly connected to a power supply for a power-on check; the PWR and RUN indicator lights should remain constantly illuminated.

2)Program Writing and Downloading

Once you have confirmed that the product is in good condition, you can proceed to program the controller. The programming should be performed using the XDPPro software on your personal computer. Once the program is completed, you can download it to the controller. The general operating procedure is as follows:



[Note]: Please connect the programming cable before powering on the controller; this will effectively prevent the serial port from being damaged!

3)Program Debugging

Under ideal conditions, the controller is operating normally; however, if a programming error is detected in the controller's program and modification is required, the program must be re-written into the controller while it is still running.

① Connect the controller to the computer via an Ethernet port or a RS-232 serial port;

② Modify the program; it is recommended to save the modified program as a separate file;

③ Pause the controller's operation; then load and download the modified program into the controller;

④ Monitor the controller using functions such as ladder diagram monitoring and free monitoring;

⑤ If the requirements are still not met, the program can be further modified and downloaded to the controller until the requirements are satisfied.

4)Controller Indicator Lights

When the controller is operating normally, the PWR and RUN indicator lights should remain constantly illuminated.
When the ERR indicator remains constantly lit, it indicates a malfunction in the controller's operation; please correct the program promptly.
If the PWR indicator light is not illuminated, there is likely a power supply issue; in this case, check the power supply wiring.
If the requirements are still not met, the program can be further modified and downloaded into the PLC until the requirements are satisfied.

8.2 Daily Maintenance

1)Regular Product Inspection

Although the motion controller offers certain noise immunity and high stability, it is still advisable to develop the habit of regularly inspecting and maintaining the controller.
The examination items include:

- Are the controller's input and output terminals, as well as the power supply terminal, loose or not securely fastened?
- Is the communication port in good condition?
- Does the power indicator light turn on?
- Clear any accumulated dust from the exterior of the controller to prevent dust or conductive particles from entering the internal interfaces of the controller;
- Wherever possible, ensure that the controller's operating and storage environment complies with the standards specified in Section 2.1.1 (General Specifications) of this manual.

2)Discard

When you decide to dispose of this product, please treat it as industrial waste.

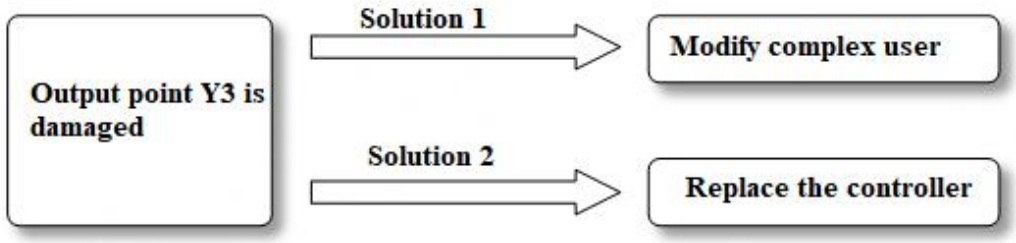
9. Soft Component Switching

9.1 Feature Overview

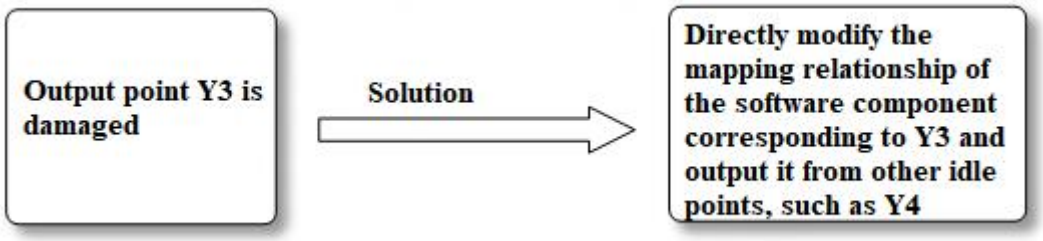
Users often encounter the following issue when operating the controller: when the internal optocoupler, relay, or transistor is damaged, the corresponding input/output pin becomes unusable. The only solutions are either to manually modify the complex software program or to seek assistance from the manufacturer – both approaches are not only cumbersome but also time-consuming, thereby disrupting the user's normal workflow.

The new industrial controller, independently developed by Xinje Company, helps users effortlessly resolve this challenge; end users simply need to make simple adjustments using a text display or touchscreen at the operation site, after which the controller can be put back into regular use – a simple, fast, and effective solution.

In the Past (Complex, Not Necessarily Effective)



Now – (Simple, Fast, and Effective)



9.2 Method of Operation

For damaged input/output points, we modify their mapping relationship so that the damaged point is mapped to another point; this implementation does not require any changes to the user program. We allocate a specific address range in the controller's special registers for the user to modify this mapping relationship. The user simply needs to locate the mapping address for the damaged input/output point and change the value at that address to the value of the replacement input/output point.

Method 1: Directly modify the FD register; the table below shows the mapping addresses for modifying input/output points:

Table 1: Input Point Mapping Address

Number	Function	Explain
SFD10	I00 corresponds to X**	Input terminal 0 corresponds to the index of the input image X**. Default value: 0
SFD11	I01 corresponds to X**	Input terminal 1 corresponds to the index of the input image X**. Default: 1
SFD12	I02 corresponds to X**	Input terminal 2 corresponds to the index of the input image X**. Default: 2
……	……	
SFD87	I77 corresponds to X**	Input terminal 77 corresponds to the identifier of the input image X**. Default value: 77 (Octal)

Table 2: Output Point Mapping Addresses

Number	Function	Explain
SFD110	O00 corresponds to Y**	Output terminal 0 corresponds to the identifier of the output image Y**. Default value: 0
SFD111	O01 corresponds to Y**	Output terminal 1 corresponds to the identifier of the output image Y**. Default: 1
SFD112	O02 corresponds to Y**	Output terminal 2 corresponds to the identification number of the output image Y**. Default: 2
……	……	
SFD187*	O77 corresponds to Y**	Output terminal 77 corresponds to the identification number of the output image Y**. Default value: 77 (Octal)

As shown in the table above, the special register at address SFD10 originally holds the value 0; when we change this value to 7, all instances of X0 in the program correspond solely to the external input point X7. It is important to note that, at this point, the value in SFD17 must also be changed to 0 – that is, to implement the swap operation. As a result, the original X0 will correspond to the external input point X7, and the original X7 will correspond to the external input point X0.

[Note]:

※1: After making the changes, the controller must be powered on again for the changes to take effect.

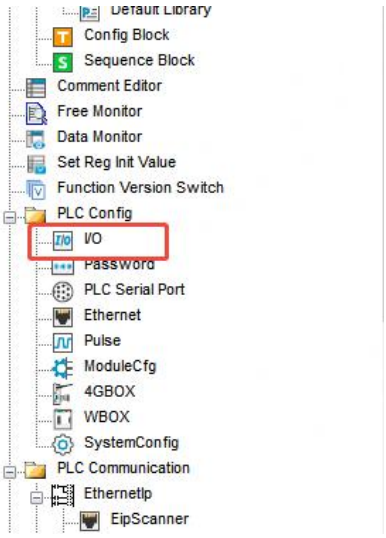
※2: When modifying the mapping of individual input/output points, please note that input and output point numbers are in octal format, while address numbers are in decimal format; ensure that you match the numbers correctly.

※3: When making modifications, be sure to perform the address mapping swap – for example, when changing the address of X0 to 5, the address of X5 should be changed to 0.

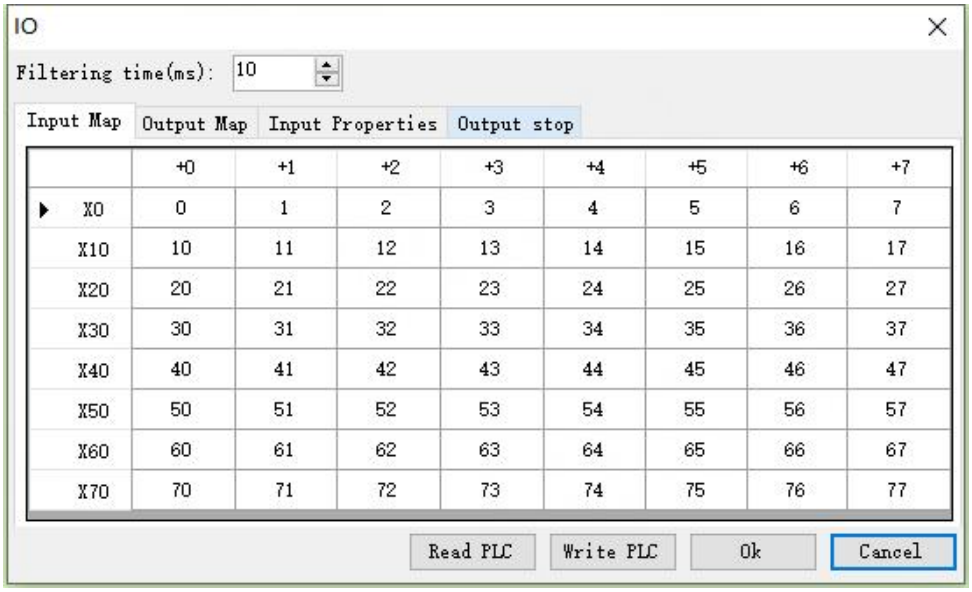
※4: For mapping relationships, please ensure that there is a one-to-one correspondence.

※5: Directly modifying values in the SFD online is a feasible but not recommended approach; it is advisable to use Method 2.

Method 2: Modify directly within the software – click "Engineering Bar" → "PLC Configuration" → "I/O", as shown in the figure below:

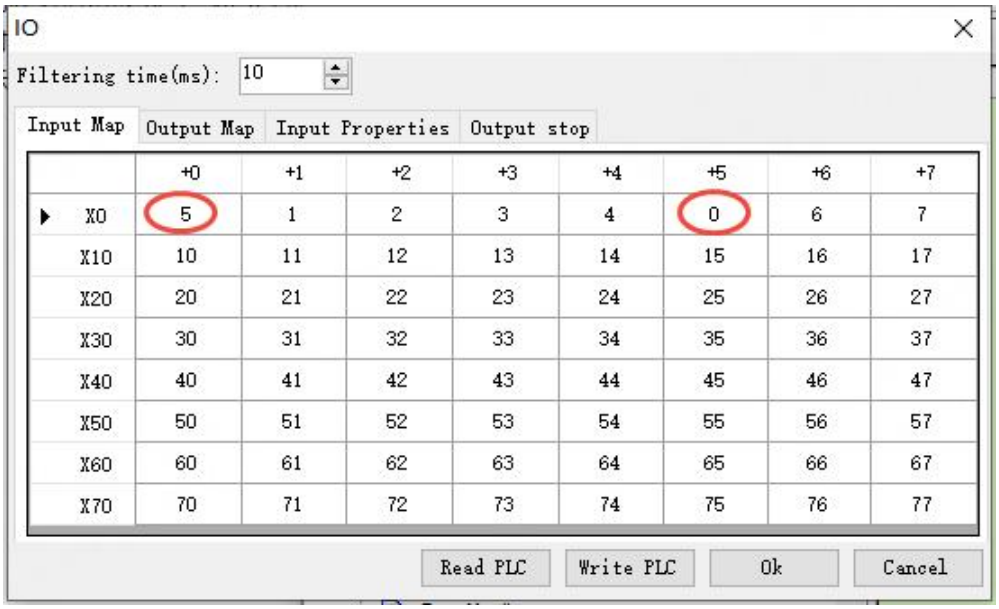


Make modifications in the pop-up configuration panel:



	+0	+1	+2	+3	+4	+5	+6	+7
X0	0	1	2	3	4	5	6	7
X10	10	11	12	13	14	15	16	17
X20	20	21	22	23	24	25	26	27
X30	30	31	32	33	34	35	36	37
X40	40	41	42	43	44	45	46	47
X50	50	51	52	53	54	55	56	57
X60	60	61	62	63	64	65	66	67
X70	70	71	72	73	74	75	76	77

To swap X0 and X5, change the mapping value of X0 to 5 and the mapping value of X5 to 0, as shown in the figure below:



	+0	+1	+2	+3	+4	+5	+6	+7
X0	5	1	2	3	4	0	6	7
X10	10	11	12	13	14	15	16	17
X20	20	21	22	23	24	25	26	27
X30	30	31	32	33	34	35	36	37
X40	40	41	42	43	44	45	46	47
X50	50	51	52	53	54	55	56	57
X60	60	61	62	63	64	65	66	67
X70	70	71	72	73	74	75	76	77

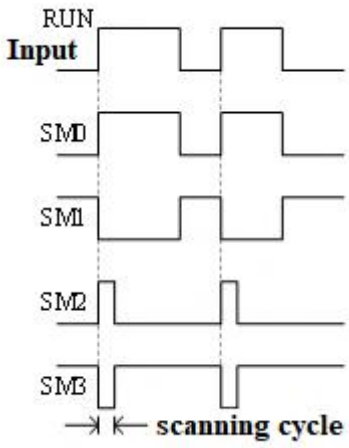
Appendix

Appendix 1: List of Special Soft Components

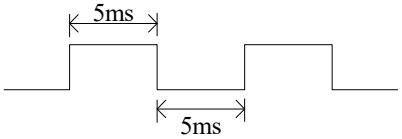
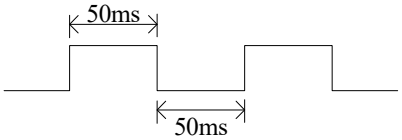
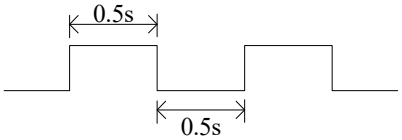
Appendix 1 primarily introduces the functional applications of special software components, data registers, and FlashROM registers in the XA600 series of industrial intelligent controllers, facilitating quick reference and lookup by users.

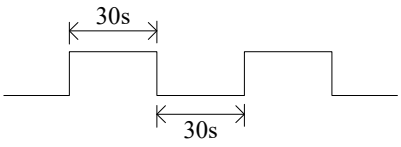
Appendix 1.1: List of Special Auxiliary Relays

1)Initial state (SM0–SM5)

Number	Function	Explain	
SM000	Run On Coil		The PLC remains ON during operation.
SM001	Run OFF Coil		The PLC is always OFF during operation.
SM002	Initial Forward-Pulsed Coil		The first scan cycle after the PLC starts operating is ON.
SM003	Initial Negative Pulse Coil		The first scan cycle after the PLC starts operating is OFF.
SM004	PLC Operation Error Coil	When SM4 is set to ON, it indicates that an error has occurred during the PLC operation.	

2)Oscillatory Pulse (SM11–SM14)

Number	Function	Explain
SM011	Oscillates at a frequency of 10 ms per cycle	
SM012	Oscillates at a frequency of 100 ms per cycle	
SM013	Oscillates with a frequency of 1 Hz	

Number	Function	Explain
SM014	Periodic oscillation at a frequency of 1 minute	

3)Label (SM20–SM22)

Number	Function	Explain
SM020	Zero Position	When the result of the addition or subtraction operation is 0, set to ON.
SM021	Borrow	Set to ON when a subtraction operation causes an overflow.
SM022	Carry	When an arithmetic overflow occurs, set to ON.

4)PC Pattern (SM30~SM34)

Number	Function	Explain
SM030	PLC Initialise	PLC restored to factory settings
SM032	Clear Register	When driving this M, the ON/OFF image memory for HM and HS can be reset to zero, and the current values for HT, HC, and HD can also be reset to zero.
SM034	All Outputs Disabled	The PLC's output indicator lights are completely off, but the output status at terminal Y remains unchanged.

5)Step Ladder (SM40)

Number	Function	Explain
SM040	Process Execution Flag	Set to ON during process execution.

6)Interrupt Disable (SM70–SM90)

Number	Address Number	Function	Explain
SM070	I40**	Disable Timed Interrupt 0	After executing the EI instruction, even if an interrupt is enabled, the corresponding timer interrupt will not trigger independently when this SM operation is executed.
SM071	I41**	Disable Timed Interrupt 1	
SM072	I42**	Disable Timed Interrupt 2	
SM073	I43**	Disabling Timed Interrupt 3	
SM074	I44**	Disable Timed Interrupt 4	
……	……	……	
SM089	I59**	Disable Timed Interrupt 19	
SM090		Disable All Timed Interrupt	All interrupts are prohibited.

7)Communications (SM140–SM193)

Serial Port Number	Number	Function	Explain
Serial	SM150	Modbus Command Execution	Set to ON when the instruction is executed.

Port 1		Flag	Set to OFF upon completion of execution.
	SM152	Free-format Communication Transmission Flag	Set to ON when the instruction is executed. Set to OFF upon completion of sending.
	SM153	Free- format Communication Reception Completion Flag	Set to ON when a data frame is received or when the data reception timeout occurs; The user program must be set to OFF.
Serial Port 2	SM160	Modbus Command Execution Flag	Same as SM150
	SM162	Free- format Communication Transmission Flag	Same as SM152
	SM163	Free- format Communication Reception Completion Flag	Same as SM153
Serial Port 3	SM170	Modbus Command Execution Flag	Same as SM150
	SM172	Free- format Communication Transmission Flag	Same as SM142
	SM173	Free- format Communication Reception Completion Flag	Same as SM143
Serial Port 4	SM180	Modbus Command Execution Flag	Same as SM150
	SM182	Free- format Communication Transmission Flag	Same as SM152
	SM183	Free- format Communication Reception Completion Flag	Same as SM153

8)Sequential Function Block (SM300–SM399)

Number	Function	Explain
SM300	BLOCK1 Executing Flag	Execution mode: ON
SM301	BLOCK2 Executing Flag	Execution mode: ON
SM302	BLOCK3 Executing Flag	Execution mode: ON
SM303	BLOCK4 Executing Flag	Execution mode: ON
SM304	BLOCK5 Executing Flag	Execution mode: ON
……	……	……
SM396	BLOCK97 Executing Flag	Execution mode: ON
SM397	BLOCK98 Executing Flag	Execution mode: ON
SM398	BLOCK99 Executing Flag	Execution mode: ON
SM399	BLOCK100 Executing Flag	Execution mode: ON

9)Error Detection (SM400–SM414)

Number	Function	Explain
SM400	I/O Wrong	
SM403	From/To Command Error Flag	
SM404	Pid Command Error Flag	
SM405	No User Program	Internal code validation error
SM406	User Program Error	Execution code, configuration table, or interrupt table validation error
SM407	SSFD Calibration Error	
SM408	Memory Error	Unable to erase or write to Flash memory
SM409	Calculation Error	
SM410	Offset Overflow Error	The offset exceeds the soft component range.
SM411	FOR-NEXT Overflow Error	
SM412	Invalid Data Padding Bit	
SM413	Encryption Verification Error	
SM414	FLASH Register Data Error	
SM415	Rtc Real-Time Clock Error	

10) Error Message (SM450–SM465)

Number	Function	Explain
SM450	System Error Flag	
SM451	Firmware Interrupt Flag	
SM452		
SM453	Sd Card Error Flag	
SM454	Power Supply Has Experienced A Power Outage.	
SM455	Power-Off Data Retention Error	

Appendix 1.2 – List of Special Data Registers

1)Clock (SD10–SD19)

Number	Function	Explain
SD010	Current Scanning Cycle	100 μs; Unit: μs
SD011	Minimum Scan Time	100 μs; Unit: μs
SD012	Maximum Scan Time	100 μs; Unit: μs
SD013	Second (Clock)	0~59
SD014	Minutes (Clock)	0~59
SD015	Hour (Clock)	0~23
SD016	Day (Clock)	0~31
SD017	Month (Clock)	0~12
SD018	Year (Clock)	2000~2099
SD019	Week (Clock)	0 (Sun) – 6 (Sat)

2)Label (SD20–SD31)

Number	Function	Explain
SD020	Model	
SD021	Model (8-Bit) | Serial Number (8-Bit)	
SD022	Compatible System Version Number (Low) System Version Number (High)	
SD023	Compatible Device Version Number (Low) Device Version Number (High)	
SD024	Device Information	
SD025	Device Information	
SD026	Device Information	
SD027	Device Information	
SD028	Compatible Host Computer Version	
SD029	Compatible Host Computer Version	
SD030	Compatible Host Computer Version	
SD031	Compatible Host Computer Version	

3)Step Ladder (SD040)

Number	Function	Explain
SD40	Current Execution Flow S's Label	

4)Communication (SD140–SD199)

Serial Port Number	Number	Function	Explain
Serial Port 1	SD150	Modbus Read/Write Command Execution Result	0: Correct 100: Reception Error 101: Receive timeout 180: CRC Error 181: LRC Error 182: Invalid station ID 183: Send buffer overflow 400: Function Code Error 401: Invalid address 402: Invalid length 403: Data Error 404: Slave server busy 405: Memory error (FLASH erasure/programming)
	SD152	Free-format Communication Send Result	0: Correct 410: Free-format send buffer overflow
	SD153	Free-format Communication Reception Result	0: Correct 410: Data transmission length overflow 411: Short Data Reception 412: Received Data Length 413: Reception Error 414: Receive timeout 415: No starting character 416: No terminator
	SD154	Number Of Data Points Received Via Free-format Communication	Counted in bytes, excluding the start and end symbols.
	SD155	Slave Address For Modbus Command Communication Anomalies	0: Indicates that the SD140 has no error messages. Non-zero: Indicates an error exists in SD140; the station number of the currently faulty subordinate device is displayed accordingly.
	……		
	SD159		
Serial Port 2	SD160	Modbus Read/Write Command Execution Result	Same as SD150
	SD162	Free-format Communication Send Result	Same as SD152
	SD163	Free-format Communication Reception Result	Same as SD153
	SD164	Number Of Data Points Received Via Free-format Communication	SD154
	SD165	Slave Address For Modbus Command Communication Anomalies	Same as SD155
	……		
	SD169		
Serial Port 3	SD170~SD179		Same as SD150–SD159
Serial Port 4	SD180~SD189		Same as SD150–SD159

5)Sequential Function Block (SD300–SD399)

Number	Function	Explain
SD300	BLOCK1 – Current Instruction Number	Use this value during BLOCK monitoring.
SD301	BLOCK2 –Current Instruction Number	Use this value during BLOCK monitoring.
SD302	BLOCK3 –Current Instruction Number	Use this value during BLOCK monitoring.
SD303	BLOCK4 –Current Instruction Number	Use this value during BLOCK monitoring.
SD304	BLOCK5 –Current Instruction Number	Use this value during BLOCK monitoring.
……	……	……
SD396	BLOCK97 –Current Instruction Number	Use this value during BLOCK monitoring.
SD397	BLOCK98 –Current Instruction Number	Use this value during BLOCK monitoring.
SD398	BLOCK99 –Current Instruction Number	Use this value during BLOCK monitoring.
SD399	BLOCK100 –Current Instruction Number	Use this value during BLOCK monitoring.

6)Error Detection (SD400–SD414)

Number	Function	Explain
SD400	I/O Type Of Error	1: Incorrect input terminal configuration 2: Incorrect output terminal configuration 3: IO configuration – Flash data error 4: Digital filter parameter conflict – please initialize the PLC.
SD403	From/To Command Error Type	1: Incorrect FROM command ID 2: TO instruction ID error 3: The number of FROM instructions is too high; it should be less than or equal to 60. 4: The number of TO instructions written is too high; it should be ≤ 60 instructions.
SD404	Pid Command Error Type	1: The starting address of the PID command parameters must be an even number.
SD405	No User Program	1: Please download the user program. 2: User program has been cleared
SD406	User Program Error Type	1: Internal CRC check error 2: Execution Code CRC Check Error 3: Configuration table CRC check error 4: Interrupt Table CRC Check Error 5: Sequential Function Block CRC Check Error 6: Initial data CRC check error 7: PF Code CRC Check Error 8: Module configuration – CRC check error 9: Sensitive data CRC check error 10: CLR_PF file CRC check error
SD407	SSFD Data CRC Check Error	
SD408	FLASH Erasing/Writing Error Type	1: FLASH error 2: FLASH error 3: FLASH memory write/erase operation exceeded capacity limit 4: An erase/write FLASH operation occurs at power-on; in the event of a power failure, SFD/FD

Number	Function	Explain
		data may become abnormal. 5: Frequent FLASH programming and erasing operations may affect the service life of the PLC. 6: FLASH address write/erase out-of-bounds error 7: FLASH is busy – please try again later 8: Flash authentication code entry error (may occur when the program is interacting with Flash during online download) 9: FLASH authentication error 16388: Upon power-on, a FLASH erase/write operation is performed; in the event of a power failure, SFD/FD data may become abnormal. 16389: Frequent FLASH programming and erasing operations may affect the service life of the PLC.
SD409	Calculation Error Type	1: Division by zero error 2: MSET – The preceding operand is less than the following operand. 3: ENCO/DECO encoding/decoding instruction – data bit count exceeds limit 4: BCD code error 5: The number of target elements for bit-wise left/right shift should be less than 1024. 6: The number of bits for left/right shift should be greater than 0 and less than the number of target elements. 7: Square root calculation error 8: The number of target components to be moved left or right should be less than 512. 9: The character left/right shift value must be greater than 0 and less than the number of target components. 10: GRY command encoding data exceeds the valid range 11: DGRY command encoded data exceeds the valid range 12: GBIN instruction encoded data exceeds the valid range 13: DGBIN instruction encoded data exceeds the valid range 14:32 – The three-parameter floating-point comparison precision exceeds the allowable range; operations will be performed using the default 2-bit precision. 15: The comparison precision for the 64-bit three-parameter floating-point operation exceeds the allowable range; calculations will be performed using the default 4-bit precision. 16: BDWTD – The BECON transmission count is negative; a positive value is valid.
SD410	Offset Error Type	1: This soft component does not support the offset operation. 2: The offset value exceeds the allowable range for the soft component.
SD414	FLASH Register Data Error Type	1: SFD register data anomaly – the system initializes it. 2: FD register data anomaly – the system resets it to zero. 3: MFD register data anomaly – the system resets it to zero.

Number	Function	Explain
SD415	RTC Real-Time Clock Error	1: The RTC power supply is experiencing low voltage; the time must be rewritten. 2: RTC data write operation – clock chip did not respond with an ACK signal 3: RTC writes an invalid date or time 4: RTC write timeout 5: RTC read timeout 6: RTC bus access timeout 7: RTC bus busy 8: RX8900 RAM register data validation failed 127: Unknown RTC error

7)Error Detection (SD450–SD465)

Number	Function	Explain
SD450	System Error Type	1: Scan cycle exceeds maximum limit 2: Application to Control Block failed 3: Accessing an illegal address 4: CPU is operating under overload; it is recommended to optimize the program.
SD451	Enter Hardfault Interrupt	1: Memory error 2: Bus Error 3: Incorrect usage 4: Undeclared instruction 5: Soft Interrupt 6: Instruction Prefetch Abort 7: Data access interruption 10004: Illegal instruction 10022: Abnormal termination 10007: Invalid address 10008: Floating-point operation exception 10011: Illegal memory access 10015: Terminate Process
SD452	Hardware Error Code	
SD454	Power Outage Duration	Power-off duration exceeds {x} ms
SD455	Power-off Data Retention Error	1: Abnormal data retention upon power loss; the system does not reset this data. 2: Abnormal data retention upon power loss; the system resets this data to zero.

8)Version Information (SD990–SD993)

Number	Function	Explain	Remarks
SD990	Firmware Version Compilation Date	Low 16-bit field	
SD991	Firmware Version Compilation Date	High 16-bit field	

9)Special Functions (HSD50–HSD55)

Number	Function	Explain
HSD50	FLASH Write/Erase Cycle Count	When SFD or FD values are abnormal, you can examine the variation pattern of these values.
HSD51	Power Loss Detection	CPU operation time after power loss (unit: 100 μs)
HSD52	Last PLC Runtime (Low 16-Bit Value)	Two characters; unit: 1s
HSD53	Last PLC Runtime (High 16-Bit Value)	

Number	Function	Explain
HSD54	Current PLC Runtime (Low 16-Bit Value)	Two characters; unit: 1s
HSD55	Current PLC Runtime (High 16-Bit Value)	

11) Error History (HSD80–HSD179)

Number	Function	Explain
HSD79	Error List Index Value	Each of the five error-related registers is divided into a "System Time Period" and an "Error Information Section": (1) System time period (first three registers): Stores the PLC system time at the time an error occurred. Storage format: Hexadecimal values; these must be converted to decimal values by grouping them into sets of two hexadecimal characters each, corresponding to Year / Month / Day / Hour / Minute / Second. (2) Error Message Section (last two registers): Stores the error type and details. Storage format: Decimal value; after direct reading, refer to the relevant error code lookup table in the Appendix of the P Manual to find the corresponding error description.
HSD80~HSD84	Article 1: Error Message	
HSD85~HSD89	Article 2: Error Message	
……	……	
HSD140~HSD144	Article 13: Error Message	
HSD145~HSD149	Article 14: Error Message	
HSD150~HSD154	Article 15: Error Message	
HSD155~HSD159	Article 16 – Error Message	
HSD160~HSD164	Article 17: Error Message	
HSD165~HSD169	Article 18: Error Message	
HSD170~HSD174	Article 19 – Error Message	
HSD175~HSD179	Article 20: Error Message	
HSD190~HSD194	Article 21: Error Message	
HSD195~HSD199	Article 22: Error Message	
……	……	
HSD450~HSD454	Article 75: Error Message	
HSD455~HSD459	Article 76: Error Message	

Appendix 1.3: List of Special Flash Registers

The asterisk (*) indicates that the change requires a power cycle to take effect.

1)I-Filtering

Number	Function	Explain
SFD0*	Input Filter Timing Value (Default: 10 ms)	
SFD2*	Watchdog Timeout Duration (Default: 200 ms)	

2)Special Function Configuration

Number	Function	Explain
SFD3*	Special Function Configuration Default Value: 0x0000	Bit0: Abnormal handling of the Power-Down Memory Register. 0: The system clears this bit; 1: No action taken.

3)I-Mapping

Number	Function	Explain	Remarks
SFD10*	I00 Corresponds To X**	Input terminal 0 corresponds to the index of the input image X**, with a default value of 0.	0Xff indicates a faulty terminal; 0Xfe indicates an idle terminal.
SFD11*	I01 Corresponds To X**	Default: 1	
SFD12*	I02 Corresponds To X**	Default: 2	
……	……		
SFD73*	I77 Corresponds To X**	Default value: 77 (octal)	

4)O-Mapping

Number	Function	Explain	Remarks
SFD74*	O00 Corresponds To Y**	Output terminal 0 corresponds to the output image Y**, with a default value of 0.	0Xff indicates a faulty terminal; 0Xfe indicates an idle terminal.
SFD75*	O01 Corresponds To Y**	Default: 1	
……	……		
SFD137*	O77 Corresponds To Y**	Default value: 77 (octal)	

5)I Attribute

Number	Function	Explain	Remarks
SFD138*	I00 Attribute	Input Terminal 0 Attributes	0: Positive logic; Others: Negative logic
SFD139*	I01 Attribute	Input Terminal 1 Attributes	0: Positive logic; Others: Negative logic
……	……		
SFD201*	I77 Attribute	Input terminal 77 – Attributes	0: Positive logic; Others: Negative logic

6)Communication

Number	Function	Explain
SFD600	COM1 Free-format Communication Buffer Size (bits)	0: 8-bit buffer; 1: 16-bit buffer
SFD610	COM2 Free-format Communication Buffer Bit Count	0: 8-bit buffer; 1: 16-bit buffer
SFD620	COM3 Free-format Communication Buffer Size	0: 8-bit buffer; 1: 16-bit buffer
SFD630	COM4 Free-format Communication Buffer Size (bits)	0: 8-bit buffer; 1: 16-bit buffer

Appendix 2: Instruction List

Appendix 2 lists all commands supported by the XA600 series of industrial intelligent controllers; these commands include basic commands, application commands, special function commands, and motion control commands. The range of applications for each of these commands is also specified.
This section is designed to allow users to quickly access instruction information. For more detailed information on how to use these instructions, please refer to the "XD/XL Series Programmable Logic Controllers User Manual – Basic Instructions Chapter" and the "Motion Control Chapter".

Appendix 2.1 – List of Basic Instructions

Mnemonic	Function	Mnemonic	Function
LD	Operation Start Normally Open Contact	ORDI	Direct Reading of Normally Closed Contacts – Parallel Connection
LDI	Operating Start Normally Closed Contact	OUTD	Direct Output to Contacts
OUT	Coil Drive	ORB	Parallel Connection of Series Circuit Blocks
AND	Series Normally Open Contact	ANB	Parallel Circuit Blocks Connected in Series
ANI	Series Normally Closed Contact	MCS	New Busbar Section – Start
OR	Parallel Normally Open Contact	MCR	Busbar Return
ORI	Parallel Normally Closed Contact	ALT	Coil Inversion
LDP	Rising-Edge Detection Operation Begins	PLS	Connect One Scanning Cycle During the Rising Edge
LDF	Rising-Edge Detection Operation Begins	PLF	Connect One Scanning Cycle During the Falling Edge
ANDP	Rising-Edge Detection – Series Connection	SET	Coil Activation and Hold
ANDF	Rising-Edge Detection (Series Connection)	RST	Coil Activation and Clear
ORP	Pulse Rising-Edge Detection – Parallel Connection	OUT	Counting Coil Drive
ORF	Pulse Falling-Edge Detection-Parallel Connection	RST	Reset Of Output Contacts; Current Value Cleared to Zero
LDD	Read the Status Directly From The Contact	END	Input/Output Processing And Return to Step 0
LDDI	Direct Reading of Normally Closed Contacts	GROUP	Instruction Block Folding Start
ANDD	Read the Status Directly From the Contacts – Series Connection	GROUPE	Instruction Block Folding Complete
ANDDI	Direct Reading of Normally Closed Contacts – Connected in Series	TMR	Timing
ORD	Read The Status Directly From the Contacts; Parallel Connection		

Appendix 2.2 – List of Application Commands

Mnemonic	Function	Mnemonic	Function
Program Flowchart			
CJ	Conditional Jump	SET	Open the Specified Workflow; Close the Current Workflow.
CALL	Subprogram Call	ST	Open the Specified Workflow Without Closing the Current Workflow.

Mnemonic	Function	Mnemonic	Function
SRET	Return From Subroutine	FOR	Loop Range Start
STL	Process Started	NEXT	Loop Scope Ends
STLE	Process Completed	FEND	Main Program Terminated
Data Comparison			
LD=※1	Start (S1) = (S2) – Turn On	AND<>※1	The Circuit Conducts When S1 = S2.
LD>※1	Turn On When S1> S2	AND>=※1	The Circuit Conducts When S1 ≥ S2.
LD<※1	Turn On At The Start (S1) <(S2)	AND<=※1	The Device Turns On When S1 ≤ S2.
LD<>※1	Turn On When S1 = S2	OR=※1	The Parallel Connection (S1) Turns On When (S2) is On.
LD>=※1	Conduction Occurs When S1 ≥ S2.	OR>※1	The Parallel Connection (S1)> (S2) Turns On.
LD<=※1	Turn On When S1 ≤ S2	OR<※1	The Parallel Connection (S1) <(S2) Turns On.
AND=※1	The Circuit Conducts When S1 = S2.	OR<>※1	The Parallel Connection (S1) Turns On When (S2) Is On.
AND>※1	The Circuit Conducts When S1> S2.	OR>=※1	The Parallel Path (S1) Turns On When S1 ≥ S2.
AND<※1	The Circuit Conducts When S1 is Connected in Series With S2.	OR<=※1	The Parallel Path (S1) Turns On When S1 ≤ S2.
Data Transfer			
CMP※1	Data Comparison	EMOV	Floating-Point Number Transfer
ZCP※2	Data Interval Comparison	FWRT※1	FlashROM Write Operation
MOV※1	Transmit	MSET	Batch Set
BMOV	Data Block Transfer	ZRST	Batch Reset
PMOV	Data Block Transfer	SWAP	High and Low Byte Swap
FMOV※2	Multiple-Point Repeated Transmission	XCH※2	Two Data Exchanges
EDMOV	Double-Precision Floating-Point Number Transmission		
Data Operation			
ADD※1	Addition	MEAN※2	Averaging
SUB※1	Subtraction	WAND※2	Logical AND
MUL※1	Multiplication	WOR※2	Logic OR
DIV※1	Division	WXOR※2	Logical XOR
INC※1	Add 1	CML※2	Invert
DEC※1	Subtract 1	NEG※2	Negate
Data Shifting			
SHL※2	Arithmetic Left Shift	ROR※2	Circular Right Shift
SHR※2	Arithmetic Right Shift	SFTL※2	Left Shift
LSL※2	Shift Left Logical	SFTR※2	Right Shift
LSR※2	Shift Right Logical	WSFL	Text Left Shift
ROL※2	Circular Left Shift	WSFR	Right-Align Text
Data Conversion			
WTD	Single-Word Integer to Double-Word Integer Conversion	ASCI	Hexadecimal to ASCII Conversion
FLT※2	Convert A 16-Bit Integer to a Floating-Point Number	HEX	ASCII to Hexadecimal Conversion
FLTD	Convert 64-Bit Integer to Floating-Point Number	DECO	Decoding
INT※2	Convert Floating-Point Number to Integer	ENCO	High-Level Encoding
BIN	BCD to Binary Conversion	ENCOL	Low-Level Encoding

Mnemonic	Function	Mnemonic	Function
BCD	Binary to BCD Conversion	DWTD	Double-Byte Integer to Four-Byte Integer Conversion
BDWTD	Two-Byte Integer to Four-Byte Integer Batch Conversion	ECON	Convert Floating-Point Number to Double-Precision Floating-Point Number
BECON	Batch Conversion of Floating-Point Numbers to Double-Precision Floating-Point Numbers	DFLTD	Convert a Two-Byte Integer to a Double-Precision Floating-Point Number
QFLTD	Convert a 64-Bit Integer to a Double-Precision Floating-Point Number	DINTD	Convert Double-Precision Floating-Point Number to a Two-Word Integer
QINTD	Convert Double-Precision Floating-Point Number to a 64-Bit Integer		
Float-Point Arithmetic			
ECMP※3	Floating-Point Number Comparison	SIN※3	Floating-Point SIN Function
EZCP※3	Floating-Point Number Range Comparison	COS※3	Floating-Point COS Operation
EADD※3	Floating-Point Addition	TAN※3	Floating-Point TAN Operation
ESUB※3	Floating-Point Subtraction	ASIN※3	Floating-Point Inverse SIN Function
EMUL※3	Floating-Point Multiplication	ACOS※3	Floating-Point Number Inverse COS Operation
EDIV※3	Floating-Point Division	ATAN※3	Floating-Point Number Inverse TAN Operation
ESQR※3	Square Root of a Floating-Point Number	EDCMP	Double-Precision Comparison
EDADD	Double-Precision Addition	EDSUB	Double-Precision Subtraction
EDMUL	Double-Precision Multiplication	EDDIV	Double-Precision Division
Clock Operation			
TRD	Clock Data Reading	TSUB	Clock Data Subtraction Operation
TWR	Clock Data Write	HTOS	Convert Time (Hours, Minutes, Seconds) into Seconds
MOV	Precise Clock BD Board Data Reading	STOH	Convert Seconds into Hours, Minutes, and Seconds
TO	Precise Clock BD Board Data Write	TCMP	Time (Hours, Minutes, Seconds) Comparison instruction
TADD	Clock Data Addition Operation	DACMP	Date (Year, Month, Day) Comparison Directive

[Note]:

Unless otherwise specified, instructions are generally 16-bit and do not support 32-bit or 64-bit instruction formats.

※1: Instructions marked with ※1 represent either 32-bit or 64-bit instructions. Generally, a 32-bit instruction is denoted by prefixing its corresponding 16-bit instruction with the letter "D"; for example, the 32-bit version of the ADD instruction is "DADD". Similarly, a 64-bit instruction is denoted by prefixing its corresponding 16-bit instruction with the letter "Q"; for example, the 64-bit version of the ADD instruction is "QADD".

※2: Instructions marked with ※2 are 32-bit instructions; typically, a 32-bit instruction is represented by prefixing its corresponding 16-bit instruction with the letter "D"; for example, the 32-bit instruction for ADD is DADD.

※3: Instructions marked with ※3 are 32-bit instructions and do not take the form of 16-bit instructions.

Appendix 2.3 – List of Special Instructions

Mnemonic	Function	Mnemonic	Function
ETHERCAT Bus – H Motion – Single-Axis Function			
A_PWR	Axis Enable	A_RST	Axis Error Correction
A_WRITE	Modify Electrical Origin	A_MODE	Modify Control Mode
A_STOP	Stop Motion	A_HALT	Suspend
A_MOVEA	Absolute Position Motion	A_MOVER	Relative Positional Motion
A_CMOVEA	Absolute Position Continuous Motion	A_CMOVER	Relative Positional Continuous Motion
A_VELMOVE	Speed-Controlled Motion	A_MOVESUP	Superimposed Motion
A_HOME	HM Return to Original	A_ZRN	Back To The Origin
A_GEARIN	Gear Binding	A_GEAROUT	Gear Unbinding
A_DRVA	Simple Absolute Position Motion	A_DRVI	Simple Relative Positional Motion
A_PROBE	Probe Function	A_CYCPOS	Periodic Position Control Motion
A_CYCVEL	Periodic Velocity Control Motion	A_CYCTRQ	Periodic Torque Control Motion
A_PLSR	Multi-Stage Speed-Displacement	A_PLSF	Variable Speed Output
A_FOLLOW	Pulse Following	A_CYCSUP	Periodic Superposition
A_PITCHCOMP	Pitch Compensation	A_BACKLASHCOMP	Backgap Compensation
X_UPDATEPARA	Continuous Power Update	A_COMBINEAXIS	Multi-Axis Synthetic Motion
A_IMMEDIATESTOP	Single-Axis Emergency Stop	A_RSTFERR	Reduction Deviation
A_TORQUECTRL	Torque Control	XFEEDPOSFILTER	Axis Position Filtering
XFERRCOMP	Single-Axis Accuracy Compensation	A_POSITIONPROFILE	Positional Profile
A_MOVEFEED	Fixed-Length Interruption	A_PLSRDF	Multi-Stage Speed-Displacement
A_MOVEADDITIVE	Target Position Accumulative Motion	A_GEARINPOS	Specific Location Gear Synchronization
A_MOVEZEROPOSITION	Quick Home Return	BMC_A_Jog	Point-to-Point Motion
BMC_A_Inch	Single-Step Motion		
Ethercat Bus – H-Motion – Axis Group Function			
G_PWR	Axis Group Enable	G_CFGAXIS	Modify The Composition Axis
G_PTP	Point-To-Point Motion	G_LINE	Linear Interpolation
G_CIRCLE	Circular Interpolation	G_HELICAL	Spiral Motion
G_MOVSUP	Superimposed Motion	G_COMPON	Compensatory Movement
G_COMPOFF	Compensation Cancellation	G_INTR	Interrupt Motion
G_GOON	Continue Exercising	G_PATHMODE	Specified Path Mode Selection
G_PATHSEL	Select Machining Path	G_PATHMOV	Path Motion
G_SETOVRD	Adjust Multiplication Factor	G_ELLIPSE	Elliptic Interpolation
G_STOP	Shaft Assembly Stopped	G_IMMEDIATESTOP	Shaft Assembly Emergency Stop
G_RST	Shaft Assembly Fault Diagnosis	G_WRITE	Adjust Axis Group Position
Ethercat Bus – H-Motion – Axis Group Function			
G_CYCPOS	Shaft Assembly Periodic	G_BEZIER	Axis-Based BÉZier

Mnemonic	Function	Mnemonic	Function
	Control Position		Interpolation
G_PTP_MUL	Axis Assembly Rapid Proportional Positioning Motion	G_ROTCUTON	Shaft Assembly Rotary Cutting Interpolation Activation
G_ROTCUTOFF	Axle Assembly Rotary Cutting Interpolation – Close	G_PATHSEL_2	Shaft Assembly – Select Machining Path_2
G_TOOLWR	Tool Value Write	G_TOOLRD	Tool Value Reading
G_TOOLSEL	Tool Value Loading	G_PROBE	Axial Probe Set
BMC_G_SetOverridelmd	Axis Group – Immediate Speed Modification	BMC_G_ReadPathSel	Read Path for Data Loading
Ethercat Bus – H Motion – Cam Function			
CAMTBLSEL	Cam Timing Load	CAMIN	Cam Start
CAMOUT	Cam Release	CAMPHASE	Phase Compensation
CAMRD	Cam Dial Reading	CAMWR	Camshaft Timing
CAMPOINTADD	Additional Key Points	CAMPOINTDEL	Key Point Removal
CAMTBLDEL	Camshaft Unloading	CAMWRMUL	Cam Schedule Batch Modification
CAMTBLGEN	Cam Schedule Generation	CAMSLAVEPOSGET	Calculation Based On Shaft Position
CAMCLUTCHON	Cam Clutch On	CAMCLUTCHOFF	Cam Clutch: Off
CAMTRANSLATE	Cam Timing Offset	X_FLYSAW	Post-Production Trimming
X_ROTARYCUT	Flying Shear	CAMSKIPWR	Cam Jump Writing
CAMSKIPRD	Cam Jump Read	CAMBOUNDS	Cam Upper And Lower Limits
-	Custom Camshaft	CAMCOMP	Master-Slave Compensation
CAMEASYTTBLGEN	User-Friendly T-Shaped Curve Generation	CAMTAP	Cam Rocker Arm
CAMADD	Cam Superposition	CAMECCTBLGEN	Eccentric Wheel Cam Table Generation
CAMECCCALC	Eccentric Wheel Key Point Calculation	CAMINMARK	Optoelectronic Triggered Cam
CAMANTIREVTBLGEN	Anti-Reversal Curve Generation		
Modbus, Free-Format Communication			
COLR	MODBUS Coil Read	REGR	MODBUS Register Read
INPR	MODBUS Input Coil Read	INRR	MODBUS Input Register Read
COLW	MODBUS Single Coil Write	REGW	Modbus Single Register Write
MCLW	Modbus Multiple Coil Write	MRGW	Modbus Multiple Registers Write
SEND	Free-format Communication for Data Transmission	RCV	Free-format Communication - Data Reception
CFGCR	Serial Port Parameter Reading	CFGCW	Serial Port Parameter Writing
Ethernet Communication			
S_OPEN	Establish TCP Connection/UDP Port Monitoring	S_CLOSE	Communication Terminated
S_SEND	Free-Form Message Sending	S_RCV	Free-Form Communication Reception
M_TCP	Modbus Tcp Communication	IPSET	Ip Address Configuration

Mnemonic	Function	Mnemonic	Function
Suspend			
EI	Enable Interrupt	IRET	Return From Interrupt
DI	Disable Interrupt		
Block			
SBSTOP	Stop BLOCK Execution	WAIT	Wait
SBGOON	Continue Execution of the Suspended BLOCK.		
other			
PID	PID computing control	NAME_C	C Function Block

Appendix 3. Fault Troubleshooting Guide

When operating or debugging a PLC, users may encounter difficult problems due to a lack of experience. This section addresses the most common issues users may face and provides corresponding solutions for their reference.

1. Power-on anomaly

1) When pressing the power button to turn on the device, the power indicator light does not illuminate.

a. Check whether the controller is properly connected and whether the power socket is powered;
b. Check the controller's power adapter, as well as the power cable, display data cable, and keyboard/mouse cable; confirm that the display is correctly connected to the main unit;
c. Check whether the positive and negative terminals of the power plug are connected in reverse.

2) The power indicator light is on, but the display is not showing anything.

a. Check the monitor power supply and switch;
b. Check whether the monitor data cable has poor contact;
c. If a DisplayPort or VGA converter is being used, replace it with a converter from another brand;
d. Check the keyboard and mouse indicator lights; if the keyboard or mouse indicator lights are on, replace the monitor to troubleshoot the issue.

3) After powering on the device, neither the mouse nor the keyboard can be used.

a. Check whether the keyboard lock is engaged; unlock the keyboard.
b. If not, check whether the connection between the motherboard and the baseboard is correct, as well as whether the keyboard and mouse are properly connected;
c. Check whether a 1-to-2 adapter for keyboard or mouse is connected; if so, use the keyboard or mouse with the connections reversed;
d. Replace the 1:2 tee;
e. Replace the mouse and keyboard.

2. The system crashes or displays a blue screen during operation.

1) Check whether the controller is operating at an excessively high temperature;
2) Check whether any incorrect or expired drivers are installed;
3) Check whether the system is infected with a virus;
4) Whether system files, applications, or the disk are damaged.

3. Failed to correctly install the device driver

1) Check whether the driver is correct and up to date;
2) Whether the driver requires support from an operating system patch;
3) Whether the resources consumed by other devices conflict with those consumed by the device being driven;
4) For peripheral devices, replace the slot and reinstall the driver;
5) Replace the equipment and reinstall the drivers.

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